TRANSACTIONS



# A YEAR BOOK



## ENGINEERING SOCIETY



UNIVERSITY OF TORONTO

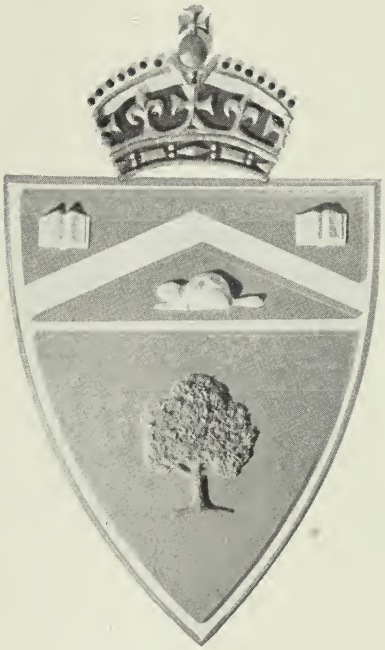
# TRANSACTIONS

# AND

# YEAR BOOK

ENGINEERING
SOCIETY

THE UNIVERSITY OF TORONTO



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UNIVERSITY OF TORONTO

## 1937 1938

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# TRANSACTIONS AND YEAR BOOK

*of the*

## University of Toronto Engineering Society

No. 51 APRIL, 1938



In placing before you the 1938 edition of TRANSACTIONS AND YEAR BOOK for your approval, we expect that several changes from previous editions will be noticed. It is probable that harsh criticism of these innovations will reach our ears on the basis of being too radical or to the detriment of the "Book". We will welcome criticism that is considered and constructive, and we believe that next year's Editor will also be grateful for such. We would ask you to remember, however, that the 1938 Board of Editors has given careful consideration to each innovation before consenting to its inclusion; also, that some ideas must be actually tried in practice before a definite decision on their value can be formed. Many a worthy suggestion has died a quick death for lack of a trial.

In retrospection of the activities of the Engineering Society during 1937-38, we find that our various functions have been carried on with successes that in some cases exceed those of previous years. We think of School Nite in particular as being an outstanding social and financial triumph. School Dinner went off with its usual flourish, as did the outstanding year dances, such as the Soph-Frosh, the Senior Fall Prom and the Graduation Ball.

We have reserved mention of the School At-Home. While this was an undoubted success for those who attended, yet from a School point of view, it was in no way the event that it might have been with the backing of Schoolmen. When men attending classes in the "little red school house" calmly discuss the merits of the School At-Home com-

pared with the At-Home of a supposedly rival faculty from the point of view of entertainment and cold cash, then one wonders to where has disappeared the spirit of "Toike Oike".

Of what does "School Spirit" consist? Is it not that inner quality that motivates a group of Schoolmen to act in harmony with each other, to back each other to the limit and to meet on a common ground that other faculties do not find because they lack an *esprit de corps?* We believe that the initial injection of this animating stimulant should be in the first days of the freshman year. The saying used to be, "A frosh is not a Schoolman until he is initiated". Now he is "received". The unfortunate change of the word and its significance is, of course, due to greater restrictions of the Faculty Council and has its merits in the lessening of the risk of physical harm. However, its demerits are to be considered as well.

School At-Home was not the only occasion where the presence of School spirit was missing. Rugby and boxing were the only inter-faculty sports that received the support of Schoolmen as spectators. Ash Wednesday is another occasion, the significance of which has been lost through lack of School co-operation.

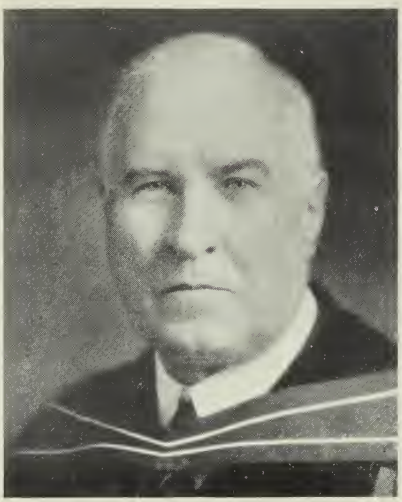
To lighten this dismal picture, we can recollect bright spots during the year when we were proud to belong to School and thus be connected with one of the finest fraternities in existence. We recall the "ballyhoo" preceding the School Dinner, the School Dinner itself, and the School Elections as among those happy occasions.

In hoping for a revival of the old comradery, we look to those at the helm of the ship to lead. They are in these positions only because their classmates are ready to follow their suggestions, and they should make a conscious effort to foster this group spirit. It is a responsible task, in that the responding enthusiasm of the Schoolmen must be guided into the proper channels.

The Board of Editors presents this TRANSACTIONS AND YEAR BOOK to you with the hope that it will be a true recording of School history for the past year. We recognize its shortcomings and duly apologize for them. To those several men who contributed articles to the YEAR BOOK section and who have not received acknowledgment, we extend our gratitude for their invaluable assistance. To our assisting editors, may we add our personal thanks for their cheerful execution of the thankless task of helping to put this edition into print. And finally, to our successor, Bill Usatis, we tender the hope that he may have every success in the heavy responsibility that he has undertaken.

K. R. B.

# A Message from the President



My first word is one of congratulation to the members of the Engineering Society on the varied and scholarly papers which make up this volume of TRANSACTIONS AND YEAR BOOK. Often a special study by a student in his undergraduate days gives a bent to his future life-work, and leads him to make himself an authority in some particular field of engineering.

Several notable features have marked this year's work in the Faculty of Applied Science. The first class in Engineering Physics will graduate this year. Fundamental mathematics and physics must more or less pervade all the courses. Aerodynamics and aeronautics are receiving fresh attention. We must be prepared to give direction in theory and practice for which there will be an ever increasing demand in our own country.

The evening courses in aeronautics have been very largely attended. Elasticity has been emphasized by Mr. Goodier, who has been allowed by the Ontario Research Foundation to give us part of his time; we hope to have a greater share of his services next year. Town-planning and sanitary engineering bulk more largely. Excellent research work has been carried on in several departments by support given from the Wallberg Bequest. Indeed, when all have done well, it is almost impossible to specify the work of individual departments.

The general revival of business has furnished many openings for our graduates. Although we are intimately affected by business conditions in the United States, there does not seem to be any reason to believe that the business recession among our friends to the South will seriously and adversely affect Canadian engineering opportunities. Mining demands are steadily increasing; chemical requirements hold steady; and there appears to be an actual shortage of civil engineers. Canada is a country worth working for, and a country which cannot stand still, unless our own folly or incompetence stay its development. I hope that all the members of the graduating class will speedily find in Canada the places for which they have prepared themeslves.

The engineering training is well-fitted to make a man a useful citizen and a real nation-builder. The thoroughness and accuracy which are indispensable to the engineer are qualities that enter into all constructive and responsible citizenship. I believe that more and more the engineer will aid in designing policies as well as public works.

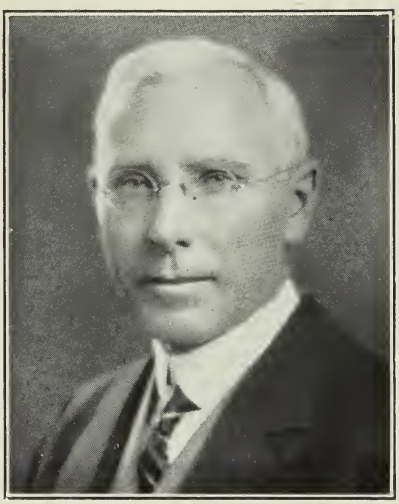
Education may be said to have a three-fold aim: to make a living; to make a life; and to mould a world. Keep these aims before you. Opportunity and good service rendered will enable you to earn a good living; qualities of character, without which professional skill may not lead to success, enable you to build up a worthy life; and the combination of science, skill and character enable you to change the face and the fortune of your country.

The engineering faculty has always been noted for its loyalty to its members, to the "Old School" and to the University as a whole. This University has no more faithful sons than its engineering graduates. Keep the fires of this loyalty burning brightly. When fortune smiles upon you, remember the needs of your ALMA MATER and try to meet them to the measure of your ability. Oncoming students would be greatly helped by the establishment of scholarships in the Engineering Faculty both at matriculation and in course. Several such scholarships have already been founded. Could not every graduating class establish a scholarship by annual gift, if not by endowment,

I hope that this great and vigorous Faculty will steadily grow in efficiency, in adaptability to changing demands, and in scientific thoroughness, so that its alumni may always have good cause to be proud of it. I know that your Faculty and the whole University wish you well, follow your careers with sympathetic interest, and will ever have reason to be proud of you.

H. J. CODY,
*President.*

# The Dean's Message for 1938



TO THE MEMBERS OF THE ENGINEERING SOCIETY:

*Gentlemen:*

Again the Engineering Society can record a very successful year. Student activities have been well directed and the various functions, both technical and social, which have been conducted by the Society, by the Years and the Clubs, have also been quite successful. Much credit is due to all the officers, the executives and committees.

It appears, at this time, that the year shortly closing has been a satisfactory one from the academic point of view, but in saying this at the end of February, we all have mental reservations when we think of the testing time in the month of April. Let me say here, however, that if the various gentlemen who have devoted so much time to student affairs do as well academically as their predecessors of last year (with several exceptions), the Engineering Society will have reason to be proud. There is no doubt that student leadership and academic attainment can and do go together.

If last year, in this foreword to the TRANSACTIONS AND YEAR BOOK, I congratulated the undergraduates and the members of the Graduating Class on being here at this time, I can repeat it this year with even more emphasis. Affairs in the country are now much

more stable and favourable for engineering than they have been during the past few years, and even more so than a year ago. On all sides we see distinct improvement, despite the check which has occurred in the past few months. The graduating class will again go out on the rising tide of prosperity so far as engineering is concerned.

Does it occur to us where the prosperity of a community or a country originates? What, for example, are the foundations of Canada or of other portions of the Empire at this period of our history? Trace this material well-being to its source and it will be found to flow not from the ability of its statesmen—or politicians—but from the sagacity and leadership of its men of business and industry. These men do things. They plan, devise, create, and they are engineers or have engineers to help them. Leaders in the highest sense of the word, they establish great undertakings, develop and consolidate them and thus demonstrate their usefulness to the community and the nation at large. They find employment for great numbers of citizens and thereby their employment makes for individual and national prosperity.

In all this there is adventure for engineers and architects. Adventure, allied to imagination and combined with solid useful education and common sense, is the spirit of modern enterprise. Adventure in this sense has everything to commend it in an age when ordinary endeavour may have become stereotyped, but in so doing let us not think of adventure as taking risks or being foolhardy; engineers do not do so. There is much joy in work that has the spirit of adventure, especially in a country like ours.

Keep in mind that we are living in a dynamic world; it is not and cannot be static. All the new inventions have not come about by any means and do not let us delude ourselves by the idea that there is nothing new to do, to accomplish or to discover. You gentlemen are fortunate to be going out shortly into a world with much more still to do.

So I wish you all good fortune. If you are going out as the Graduating Class or if you are remaining shortly to follow in their footsteps, always remember that you will get a good send-off from your University, to which you owe so much. Remember, too, that as "School Men" you have a place to take in the country and a tradition of service, loyalty and co-operation to uphold.

Yours faithfully,

C. H. MITCHELL,

February, 1938. *Dean.*

# President's Message

Another year in the life of the Engineering Society is fading into the past, and the next milestone has already appeared on the dim horizon. Founded in the year 1885 by Dr. T. K. Thomson, the Society has grown annually in numbers and in activities.

On former occasions, similar to this, I have read the retiring President's message and noted that each of my predecessors expressed reluctance. In each case I thought that this had become the "standard" way to say good-bye. However, now I find myself facing the same situation, and wish at this time to assure you that I, like those others, am feeling regrets as I write this farewell message.

The pleasure I derived from holding the office of President during this past year, and the honour that I have had in serving you can only be imagined by a former president. For this great privilege, I have you to thank.

The Engineering Society has just terminated one of the most successful years in its history. The keenness of our members, the marvellous genius for organization has most certainly become the envy of every similar organization in the University. Without hesitation, I feel quite justified in saying that our Society is the strongest and the soundest undergraduate body on the Campus. I am sure that each one of you, like myself, are proud to say, "I am a Schoolman".

A brief review of the general activities for the past year would be appropriate at this point. The Supply Department was well stocked

and the prices determined long before the official opening of the School, thus all was in readiness for the rush which always follows. The results of the efforts expended in this department are shown in the annual financial statement and speak well for themselves.

The years as they come and go bring with them many changes, changes which are necessary for that particular time in question; thus our annual initiation this year was the result of changes. In spite of this, however, I am sure that the "flag-rush" was the most active and most spectacular form of initiation held at the University of Toronto for quite some time.

School Dinner enjoyed the usual success of former years. This is one function of which every Schoolman should be proud. As you were all told, the Society lost money on every man that attended the Dinner. Such is the case, but we like it. We were fortunate this year to have as our guest speaker, General Sir James H. MacBrien, K.C.B., C.M.G., D.S.O., Commissioner, Royal Canadian Mounted Police.

The next change which was introduced to the members of the Society this year was the Essay Contest, at which the contestants were asked to deliver their talks at a General Meeting of the Society. Unfortunately, this undertaking did not enjoy the success worthy of such a cause, but it is my firm belief, that in the years to come, provided the committees in office at that time see fit to carry on such a contest, there will be several good speakers result from such efforts.

To speak now on School At-Home; this year School At-Home was put on for Schoolmen, the price being only $4.00. Some of you may not appreciate this price reduction and the elimination of the American band idea, but when you consider that a very great percentage of the students in the faculty are responsible for their own fees while at school, the price of a dance must be considered. To those who attended the At-Home, I thank you for your co-operation, and to those who were absent, all I can say is, you missed a fine party.

Never before has there been such a Nite as February 4, 1938, for that was the date of School Nite. Once again changes were in evidence, first in the Revue, which this year was raised high above that of former years. The effect of this higher type of entertainment was, indeed, far-reaching, and the comments from various sources very encouraging. Also there is another great change, as far as School Nite is concerned. There was no subsidy required for the event and we

actually made money, thus taking School Nite from the expenditures on our financial statement and incorporating it with revenues.

The next change, which is very important and should become an annual function, is the joint meeting with the Engineering Institute of Canada. It is a splendid opportunity for all undergraduates to meet and talk with the members of the Institute, and really they are not hard to talk with, for they are practically all Schoolmen themselves.

The General Meetings were attended somewhat erratically by the students this year; some attracted well over five hundred, others only about two hundred. Let me leave this recommendation with you; whether the particular meeting looks attractive or not to you, attend it, let on it is swell, even if it hurts, for this is probably the best way to encourage your executive.

There is another change; have you noticed it? Yes, it is the TRANSACTIONS AND YEAR BOOK. Do you like it?

You have another executive coming in, already to do their bit in the life of the Society. The next year lies ahead; give them the whole-hearted co-operation that they deserve and success will be inevitable. Paul Anderson will make you a fine President, while his whole committee looks very promising.

In closing, I wish to thank all the men who have co-operated on and with the executive for their particular part in insuring the success that we have enjoyed this past year. I have purposely omitted the mention of any names, for it is practically impossible to single out from such an outstanding group of men, individuals. Best of luck to all of you in your exams, your summer activities, in fact, everything.

G. F. BEARD.

# TRANS-
# ACTIONS

ENGINEERING
SOCIETY

THE UNIVERSITY OF TORONTO

# The Development and Role of Aviation in Mining

BY MAURICE R. BROWN

*First Prize Essay in the Engineering Society Essay Contest, Senior Division.*

It is generally known that the Canadian North is truly air conscious. However, it is not common knowledge that, last year, Canadian craft carried no less than 170,000 passengers and 12,500 tons of freight. No other country in the world has ever equalled this last figure. The 170,000 passengers travelled over 7,100,000 miles. A closer appreciation of this figure might be gained when it is said that if this mileage were divided among the 833 School of Practical Science men now registered, it would mean a trip for each man of over 8,500 miles, or a return flight across the Pacific. Since 1931, the air business in this country has increased tenfold. What is behind this great advance? When it is realized that Ontario possesses the greatest gold mines on the North American continent, that the annual per capita production of minerals of our own province, at $55.00, is higher than in any other state or country in the world, and that this wealth is yours for the finding, it can readily be understood why such a search is being conducted. It has been found that the logical way of conducting this search and development is with the aid of the aeroplane.

It was the Red Lake gold rush in 1925 that marked the real birth of mining aviation in Canada. At this time, Ontario Government aircraft were used to transport men and equipment from the railway town of Sioux Lookout to the scene of activities. This focused the attention of the mining men on the possibilities of the aeroplane in mining. In this same thriving mining town of Red Lake this summer, while waiting two hours for plane connections, I myself saw seven planes land learned that a score of arrivals in a day was not uncommon.

In the year 1926, there were forty-four licensed aircraft in Canada. In 1936, this number had risen to four hundred and fifty and accompanying this increase came many changes necessitated by conditions. Unfortunately our mineral deposits are not found in the developed and accurately mapped regions of the south. A foreign pilot would get a rude awakening if he were to zoom down from the clouds and suddenly see our Precambrian Shield for the first time—a vast expanse of

rolling hills, a crazy network of countless lakes and rivers. He would see no airports, landing fields or beacons, not even an indication of habitation, save perhaps a determined power line cutting through the forests, or the sluggish smoke of a smouldering forest fire. How, then, would he adapt himself and his machine to the new conditions of our North?

Firstly, the plane would have to be equipped with pontoons which are satisfactory during the season of open water. There are no wheel undercarriage aircraft in the North. But is is during the long winter operations that flying becomes more difficult. There is a short cessation in flying during the freeze-up, at which time the planes get a semi-annual overhauling. Nature in the raw is seldom mild. During the week of November 13-20 of last year, planes of Canadian Airways, Limited, established a record when they made trips on floats to Red Lake on Wednesday and were able to resume service on Saturday, using wheels with which to land on the ice. This is an interesting exception, for this period is usually longer, and it is during this time that pontoons are changed for skis. Skis in themselves constituted a problem calling for much thought and experiment, the variables including weight, cost, strength, air resistance and practicability. The skis commonly used are of laminated oak or ash with the bottom surface being faced with metal, and the rough snow conditions have necessitated the adoption of shock-absorbing pedestals.

*A Typical View of the Precambrian Shield*

Another major problem is the pre-heating of engines before starting. It must be remembered that these planes are operating in sections of the country where 50 degrees below zero is not uncommon and hangars are few. Before starting, the oil is usually taken out of the motor and heated, while the engine is heated with a gasoline blow torch under a large metal hood that extends down to the ice. For obvious reasons this feature is quite objectionable, and it is largely on this account that multi-engined planes are not popular in the North. More recently, they have been using electric pre-heaters where power is available. Also, before starting, the wings must be swept clear of snow and frozen sleet and, for this reason, slip covers for the wings are frequently employed. Frequently too, it is difficult to obtain gasoline. Most of the larger companies have caches at various points which they have previously flown in. This occasions considerable expense, since the fuel is worth anywhere from $2.00 to $5.00 a gallon at most of these remote points.

Use of aircraft in mining may be conveniently divided into four phases—surveying, exploration, volume freighting and servicing the remote mining communities. The use of the aeroplane in surveying can be readily appreciated. This would include surveys for the preparation of maps, location of highways, railroads, power lines and power sites. Many individual prospectors have planes of their own, but most of this kind of work is being done by the larger companies. In the spring it is a very common sight to see a plane, loaded with supplies and a canoe strapped to the pontoons, take off without ceremony for some secret destination where it will leave two prospectors. Before departing, the pilot will probably arrange to meet the two at some specific place four months hence. Some prospecting companies leave only a few weeks' supplies with their men and service them at frequent intervals, perhaps moving them to some new district where a "find" has been made.

In the event of a "strike" being made in some remote district, it is common practice to fly in a light diamond drill. Thus the possibilities of the showing may be quickly determined. If the values do not stand up, the property can be abandoned at comparatively little expense. However, if drilling results are encouraging, a mine and mining town may result. If such is the case, much more work for the aeroplane is provided. Indeed, some mines do almost all of their freighting by air. An excellent example is that of the Argosy Mine, which gave a contract to Canadian Airways Limited for the flying of 956 tons of freight from the railway to its isolated property. This constituted the largest

single tonnage contract ever entered into on this continent. The isolated mining community will also have to be serviced regularly from the air in respect to passengers, mail and perishable foods, to mention only a few. Many communities could not exist without this service, while in others the aeroplane has greatly increased the standard of living.

Much is being done by the various flying companies to improve an already excellent safety record. At the present time, the Radio Department of the Ontario Forestry Branch is adding a new arm that is expected to greatly increase the safety factor for aeroplanes operating in Northwestern Ontario. This consists of a series of radio-telephone stations at strategic points. The thirty planes operating in this area are all being radio equipped.

What kind of planes are in use in the North? It should be remembered that speed is not a vital factor, but rather capacity. Most of the planes carry a pay load of from 1,000 to 2,000 pounds. Canadian Airways Limited are operating a single engined Junkers which has a pay load of three tons. This machine is commonly referred to as "the flying


*Ready to Take Off*

boxcar". There are numerous smaller all-metal German-built Junkers operating throughout the North, also Bellancas, Stinsons, Wacos, Fokkers, Fairchilds and other types. These have an average cruising speed of about 100 miles per hour. It was noticed this summer that a canoe strapped to a pontoon decreased the speed by nearly 15 miles per hour. A typical example of an air fleet is that of the Mackenzie Air Service Limited, which consists of 2 Fairchild 71C's, 2 Norsemen, 2 Fairchild 82B's, a two hundred mile-an-hour Beechcraft, an Aircruiser and two of the newest type twin-engined Fairchild "Sekanis" with a cruising speed of 180 miles per hour. All these craft are equipped with the latest two-way voice and code radio equipment.

It is companies like this one that are so quickly and profitably opening up our North country. Gold made the North what it is, but its rapid development is largely due to the aeroplane and it is the aeroplane that maintains its lines of rapid communication.

*Freshmen—Two Hundred Strong* *Flag Rush*

# Safety in Industry

BY ROWED A. GREIG

*Second Prize Essay in Engineering Society Essay Contest, Junior Division*

The basic equation in modern industry is to operate with such efficiency, production, and welfare of the workmen that profit may result. It was not generally realized till about fifteen years ago that safety in industry affected efficiency, production, and workmen's welfare to the great extent it does. U. S. Steel Corporation knew that a safe company leads in the competitive field. Judge Elbert H. Gary, Chairman of the Board of this huge corporation, expressed its policy in saying, "It pays in dollars and cents as a net result in profits during the year, to make the most liberal expenditures in protecting the lives and persons of employees."

Reasons why industry is making a safety drive are found in considering the economic effects of accidents. In 1928 an investigation was completed by the American Engineering Council in an attempt to ascertain the connection between safety and production in industrial establishments. This detailed survey covered 13,898 industrial companies, giving a complete cross-section of American industry. The statistics forming the report of this survey show a positive connection between safety and production, there being ample evidence to indicate that the industries progressing in regard to production, improvement of method, and general efficiency, are also improving in regard to safety.

Examining the facts more closely it is quite evident that production is affected by an accident in that whole processess may be held up because of a single accident. A workman may have to leave his job and devote some of the company's time to aiding an injured fellow or in repairing damage done to equipment. This results in dislocation of an organization attuned to high-speed mass production and every minute of idleness means increased overhead costs. The costly machines pay for themselves only when they are operating. Workmen draw money for injuries which ordinarily would be drawn for work done. Orders which were contracted to be filled within a certain time are not filled and there is an inestimable loss to the company in losing a customer's goodwill.

The effect on a workman of seeing an accident lowers his morale, and this injurious result is quite serious when many workmen see the accident. It takes the mind of the man off his work which ordinarily requires his whole attention, and the efficiency of the organization is so reduced. A certain amount of self-confidence is lost as thoughts of fear enter the mind. In short the accident is an interruption which stops the smooth flow of industry and hence its efficiency and production.

A government organization, as the Workmen's Compensation Board, usually handles compensation to injured workers and dependents of killed workers. They realize that responsibility for accidents, if it is to be taken, must be by the employers, and decree that compensation be paid by them, usually through insurance premiums. Most of the States in America have adopted two systems by which it benefits an employer to practice safety. One of these systems is that if the employer does not comply with the safety methods required and has no safety organization, his premium is quite high. The other system bases the rate of the premium on the accident record of the company, with it costing the employer money to operate a dangerous establishment.

The increasing responsibility to the employers, for accidents, is costing them more and more when accidents still continue to happen. This trend is seen in considering the history of responsibility briefly.

At first the injured employee was given the right to claim damages if he could establish the necessary evidence to prove that the accident was due to some personal fault or negligence of the employer. This was difficult to do as the employer could claim contributory negligence or inherent hazards of the job. The courts argued over placing the blame on the employer, the employee, or the fellow employees. This resulted in a rapid increase in litigation with little benefit to the employer or employee.

Remedial legislation placed the responsibility on the employer as he was the only one that could possibly pay the compensation. This compelled the employer to prove that the accident did not happen due to negligence on his part. If the employer was found negligent, then he had to bear the costs of compensation.

Small compensation was given at first, but the indemnity for various injuries was made standard and was increased as the seriousness of the injuries was realized. This agitation to raise the compensation to its proper value is voiced by E. L. Bowers of the Department of Economics,

Ohio State University, in his book, "Is It Safe To Work?", when he says, "As long as no more than $2,000 is paid for the loss of a leg or an arm, the amount spent for prevention will be correspondingly small. But make the cost to the employer of such an injury four, five, or eight thousand dollars, and the business of preventing accidents will take on new importance."

Industry has taken as its way out from the losses due to accidents, the adoption of safety organization. Every dollar spent in a safety campaign has paid actual hard cash money dividends. The safety measures required of industry have been made more stiff as the cause of accidents were studied and became apparent. Legislation has been passed, as the Workmen's Compensation Act of Ontario, whereby associations of employees are formed to prevent accidents in industry. It is through these safety associations that employers, at first opposed to the adoption of safety measures have since realized that safety was in their own interests, and they have become active in the field.

The Industrial Accident Prevention Associations in Ontario are an example of a safety society formed under state law and enforcing safety methods commonly used throughout the world. A study of its work gives an idea of general safety work.

Mechanical safeguarding is sponsored by this society in that member-firms protect their workmen by certain safety appliances. Experience in accidents has determined the particular hazards in industry. These hazards are corrected as in the placing of guards on grinding stones to prevent injury in the case of breakage. Safety goggles are required to be worn in operations as grinding, chipping, and routing of metals, the pouring of hot metals, oils, and corrosive acids. All machinery is properly lighted for safe operation and is in good working condition; all belts, pulleys, and gears are properly equipped with guards in place and in use; brakes, if any, are in good order; specially hazardous machinery such as saws and stamping presses are equipped with guards.

In addition, an active inspection service is maintained with the inspectors trained in accident prevention work. A record is kept by the Compensation Board of all accidents for which compensation claims have been made, and from this record the inspectors determine the firms with bad safety records and where the hazards lie. The inspector then checks up on the firm and points out to the employer by means of his record what accidents are costing him. Then the inspector goes over the plant and thoroughly inspects the safety organization. If certain mechanical

safeguarding has been neglected this is brought to the employer's attention. Approved methods of safety such as the altered arrangement of machinery or the employment of a safety engineer are suggested. The inspector has a long list of thought-provoking questions that he asks the employer. This brings forth to the light of reason safety regulations, the relative safety position of the plant, and safety education of the workmen.

The Industrial Accident Prevention Associations work with the employer to get the workman safety-conscious. The idea that is being ingrained in the mind of the workman is to be proud of an accident-free record. A method commonly employed is to have a board in a prominent place in each department of a plant on which the foreman chalks up the number of consecutive accident-free days. Every workman backs up that record and proclaims his desire for safety. Regular distribution of safety literature and its conspicuous posting, the use of safety lectures with motion pictures, educate in safety. Thus consequences of accidents are ever kept before the workman so that he is encouraged to report hazardous conditions and to exercise care.

As well as being an industrial problem, safety in industry is an important social and humanitarian problem, and for these last two reasons alone its furtherance is worthwhile. There is much to be done in this field yet, as compensation is still woefully low and the accident rate high. It must be remembered though, that while the number of accidents has decreased somewhat due to safety organization, the quantity of production has gone away up. Considering this fact it is readily apparent that accident prevention work has greatly decreased the accidents per individual product. So the ideal object of industry is to return its people to their homes uninjured at the close of each day's work.

# Arc Welding of Cast Iron

BY IRVINE W. SMITH

*Winner of First Prize in the Student Paper Competition at the joint meeting of the Engineering Institute of Canada, Toronto Branch, and the Engineering Society of the University of Toronto, on February 24, 1938.*

The use of arc welding for joining cast iron parts has come into practice during the past eight or ten years, but its general acceptance by industry has been retarded by the fact that such welds are not always reliable. Arc welding of cast iron, in general, is a very controversial subject and for this reason, the paper will be limited to one problem in particular, a problem that hinges on the successful welding of cast iron to steel. Perhaps it would be as well, before considering the problem itself, to deal briefly with the way in which it arose.

Even a casual survey of technical literature will indicate that there has been a definite trend toward greater use of welding for general constructional purposes, and this has been particularly true of the fabrication of machinery. The machine designer has learned that by taking structural plate and rolled sections, such as I beams and channels, cutting these to size and shape, either in shears or by the oxy-acetylene cutting torch, and then arc welding the pieces into a solid unit, a machine base or frame can be obtained that is stronger, lighter, and usually cheaper than the former cast iron one.

This steel base is about three times as strong in bending as a similar cast iron one would be, about two times as strong in shear, and is two and a half times as stiff. This latter quality, that of stiffness, is a decided advantage, for the tendency to-day in machining processes is toward closer limits, and as greater accuracy is demanded of machine tools, it is more important that deflection of the frame be eliminated. Moreover, with the cast iron frame permitting deflection, considerable power was used, not in useful work, but in merely bending the frame.

About 90% of the machine tools, however, require a sliding action and this is where the real problem arises, for the structural steel that makes such a strong frame provides a very poor sliding surface. No matter how efficient is the oiling system, the steel on steel contact will ultimately result in scoring.

This problem has been met in several ways, such as hardening the steel base itself, attaching to it hardened steel ways or cast iron ways, or by welding to the sliding element a bronze facing. All of these methods are essentially expensive, so that if the welded steel base is to receive the wide application that it deserves, an easier method of providing "way" surfaces will be required.

For example, lathe beds have been made for the past hundred years of cast iron, but nevertheless there are certain inherent faults. That is to say, if the legs are not properly seated on the floor at the time of bolting the lathe down, sufficient warping will take place to throw the way surfaces out of alignment. And unfortunately this is not merely a hypothetical possibility; it is a daily occurrence. One lathe manufacturer in particular has this sort of trouble with almost every lathe sold. When a complaint comes in, following the sale of a lathe, a form letter is mailed asking if the lathe has been properly levelled. Invariably the answer to this is "Yes". A service man is then sent out, whether the lathe be in Quebec or out in the West, and he usually finds that the lathe bed has been twisted due to improper bolting.

This would seem to indicate that a lathe bed is too weak in torsion. If a box section, which is strong both in torsion and in bending, could be substituted for the present design, much of the trouble would be eliminated. However, a box section is difficult to cast and must be made unnecessarily heavy, so that this is one place where the welded steel could effect large economies, *if* suitable sliding surfaces can be provided.

For some time, the possibility of welding cast iron strips to a steel base, to provide the necessary wearing surfaces, has been considered. As mentioned at the beginning of the paper, the arc welding of cast iron is not always reliable, and until it can be made so, cast iron ways will not be welded to steel bases.

The question is raised, "Why arc weld? Why not use an oxy-acetylene fusion weld or a brazed joint?" Both of these will give a satisfactory cast iron weld, but unfortunately both processes are much slower and are many times more expensive than the arc weld.

And so we are faced with problem of obtaining sound welds by means of the electric arc. The first step toward a possible solution was to find out if the weld was satisfactory from a metallurgical standpoint. Two halves of a cast iron test bar were made up and were welded together, using a well-known brand of electrode that had been especially

designed for welding cast iron. The test bar was then broken in a tensile testing machine and was found to have a tensile strength of 14,000 p.s.i. at the throat of the weld as compared with 24,000 p.s.i. in the cast iron itself. Samples were then cut from the weld and, after polishing and etching, were examined under the microscope.

It was found that between the weld and the parent metal there was a narrow band of white cast iron. The weld itself varied from a hypereutectoid steel, surrounded by a network of cementite, at A in Fig. 1, to a low carbon steel, at B, of similar composition to that of the original electrode. It was evident that, as the electrode material was deposited, in a gaseous state and at a high temperature, considerable amounts of carbon were transferred from the cast iron to the weld metal to raise its carbon content. It was also apparent that although the white cast iron and the hypereutectoid steel were brittle materials, they were at the same time, stronger in tension than the cast iron.

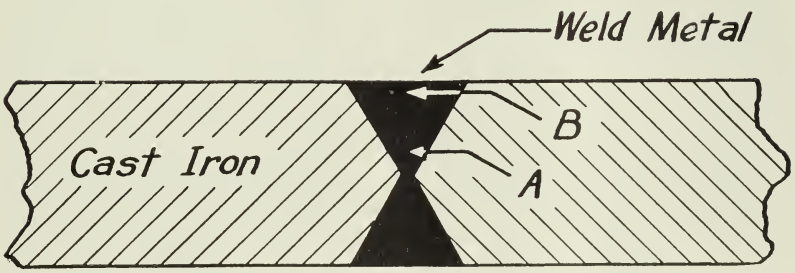



Fig. 1

This single test could hardly be accepted as conclusive evidence, but it has, in a way, served three purposes. First, it has shown that the weld metal is as strong as the parent cast iron and, if any further metallurgical improvement is to be made, it will be to lower the hardness of the weld metal in order to increase its impact strength. This could be done only by preventing the passage of carbon from the cast iron to the weld metal, and as this would present great difficulty it is probable that the hardness could be reduced more simply by annealing.

Secondly, it has shown that if the weld metal was stronger than the cast iron, and yet the test bar broke *at the weld,* a redesign of the weld itself is necessary. And thirdly, it indicates along what line further study should be made, as it is evident that additional tests should

be tried with various shapes at the joint in an effort to reduce stress concentration.

In making these tests it will be necessary to bear in mind that the test joint should as far as possible duplicate the stresses in the actual frame design. If the frame does not deflect either in torsion or bending, and that is the ideal that is aimed at, then the stresses in the cast iron welds will be comparatively simple and no great difficulty should be encountered in making a suitable design. If, however, there is deflection, the stresses may become very complicated and it will be necessary to load a model of the frame in torsion and bending in order to determine the resulting effects.

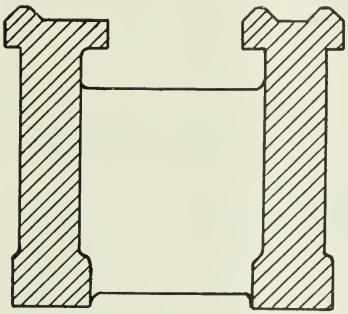


Fig. 3

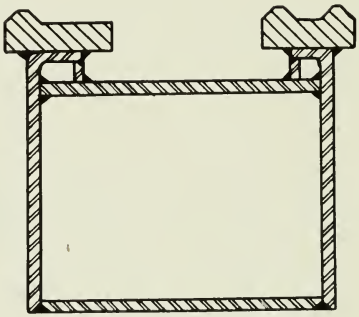


Fig. 2

Fig. 2 shows, in a very diagrammatic way, a cross section of a proposed welded steel lathe bed, which may be compared to the conventional cast iron section in Fig. 3. The advantages of the steel construction are at once evident, for although the steel section has an area of about one-half that of the cast section, its bending moment about the horizontal axis is four-thirds that of the cast section, and it also has a much greater torsional resistance.

The strength of the welded box section has been definitely established. If cast iron wearing surfaces can be successfully applied by the welding method, surfaces that will not crack or fall off in service, the machine tool builder will be in a better position to provide the accuracy that is now demanded by industry.

# Some Lessons for Engineering Students to be Learned from the Motor Car

*Adapted from an address delivered before the Engineering Society of the University of Toronto on January* 10, 1938, *by Col. J. G. Vincent, Vice President in charge of Engineering, Packard Motor Car Company.*

What I have chosen to tell you now is probably different from what you will expect. I am not going to recite a discussion on a technical subject relating to automobiles; the technical press is full of such information. Instead, I have chosen to tell you something about the engineer himself, to touch on the qualities of his mind which makes for a full experience and a successful career, to pass on to you a few of the lessons which you do not learn in college.

I have often, in moments of reflection, pondered upon the significance of the automobile in human affairs, for without argument, it is the most complicated and most expensive mechanism used by the great masses of our people. In North America there are more motor cars than telephones, sewing machines or even bath tubs, and as a topic for conversation, it by far exceeds all others. It has created vast national wealth and wide-spread public improvements; it has altered our mode of living; it has changed our industrial methods and has even influenced our ideas on education.

It is also interesting to speculate a little as to what inspired such a marvelous contrivance. From what root of man's being should the urge for a self-propelled vehicle spring. Certainly the old maxim that necessity is the mother of invention does not hold, because no necessity existed in the last century when life was attuned to the speed of the horse and buggy. The automobile was inspired, like many of man's great creations, by that innate and eternal desire for adventure; that desire of man that if stirred into action by enthusiasm and initiative to satisfy his curiosity of whatever interests him or perplexes him. This desire often resolves itself into the so-called creative urge when it aspires to do new things or even to imitate something which already exists. It was from this root, this desire of mankind for adventure, from which sprung the creation of the automobile.

The early inventors and experimenters who were endeavouring to build self-propelled vehicles or horseless carriages were considered

rational only so long as they looked upon their experimenting as a hobby, but when these same men began visioning the ultimate evolution of the horseless carriage, even in the limited perspective which their own knowledge permitted, and suggested that self-propelled vehicles might some day become common and replace horses, they were called cranks and fools. Their approaches to men of means for money or support in starting small companies to build them were met for the most part with rebuffs and ridicule. To be sure, as in all things new, the beginnings were crude; most of the attempts being simply to propel a buggy with a small gasoline or steam engine, and would have remained so had not a few men of means with an adventurous spirit aided the development by their financial support, and I suppose, because it seems to be a human trait that we can recognize in others what we possess ourselves, were these men, these financiers, able to recognize the desire for adventure that is so nearly universal and possibly exists in all people. These men certainly must have recognized that desire, even in less imaginative people, which makes them want to go places, to new places, to neighbouring cities and towns, or even only to ride out to view the country side, as a form of adventure and pleasure upon which an industry could be built, and they were, therefore, willing to risk some of their money in the attempt to produce some kind of a self-propelled vehicle to satisfy this desire. We, of course, must recognize that no one of that time could have possibly envisioned the creation and the growth to such gigantic proportions as the motor car industry has become, for I can well remember the conversations and the many popular writings which were devoted mostly to skepticism and disbelief that the motor car would ever be practical.

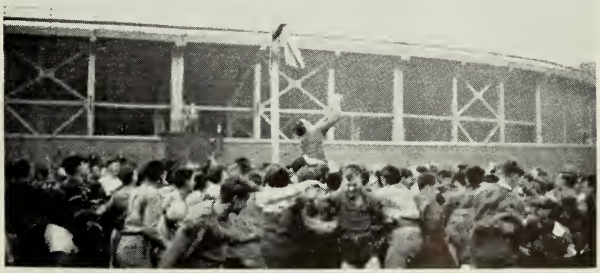
## Salesmanship in Engineering

You, of course, perhaps wonder what bearing this part of history may have on your own education, and what lesson there may be for you to gain from this. If, when you finish your college work, you pursue the vocation of engineer, one of the biggest tasks throughout your career will be to sell your ideas. Only a few, very few of you, will, perhaps, be engaged in the development of engineering creations which will subsequently develop into great industries; only a few of you, perhaps, will become involved in the creation of some great structure that will challenge the imagination of the most receptive minded people of your day; but to these few, the task of selling the idea will become the principal task. The thought of a colossal undertaking such as the Panama Canal or the Golden Gate Bridge, challenge the best

minds on earth before they are consumated, and the peril of failure is the great obstruction. But the bulk of you gentlemen who undertake engineering in less impressive projects will be constantly faced with the necessity of selling ideas and in overcoming the fears and prejudices of all those who must risk something by whatever you do. Here I am reminded of a historical classic in salesmanship.

Christopher Columbus was at heart a great adventurer, an adventurer in science, an explorer in the mystery of the universe. In his studies to satisfy his curiosity about the earth, he deduced with accuracy and clarity that the earth upon which we live is a globe, and he wanted desperately to prove this deduction by circumnavigating the earth. Now what was he to do? What would you have done under the circumstances? The belief of everyone of his day, including the great scholars, was that the earth is flat. Sailors and travelers brought back legends of ships sailing off the face of the earth. The boldest of the sea-faring men shivered and swore with fear whenever they got out of sight of land.

Now Columbus' idea of a spherical earth was just too ridiculous to believe. He could not convince even the great scholars of his day, by the use of all his astronomical knowledge that this earth was anything but flat. The impact of this very new idea with the old was so great that he was run out of his native country. Columbus had learned that reason alone could not sell his idea, but he did know the power of the lust for riches. He knew that lust could overcome all



*Frosh vs. Sophs* *Flag Rush*

fears, for during all past ages men willingly risked their necks for gold. The story is old to you, of how Columbus sold Queen Isabella the idea that by sailing due west he would reach India, the land of fabulous wealth, by the shortest route and by the safest route, and that by so doing he could bring back untold wealth safe from the raids of pirates. It was by this stratagem that Columbus gained his ends; by giving to his new idea tremendous and compelling economic evaluation. And as you know, and as Columbus had no idea of knowing or could possibly have concieved of what would happen, both the new knowledge of the earth's shape and the consequent discovery of America brought great changes in the social, economic and even religious affairs of our peoples.

## ATTITUDE OF THE ENGINEER

But there is more to be learned from this than that skepticism is the everlasting nemesis of the engineer. First of all, the truly creative engineer must be inspired by characteristics which permits no limitations to his knowledge or to his interests, and this characteristic cannot be emphasized enough. The early experimenters on horseless carriages were embarking for the most part on some sort of an adventure to satisfy their curiosity, perhaps only to test their skill in accomplishing something only as a hobby. Others, no doubt had more materialistic ideas, but it is safe to say that none of these early pioneers would have suffered the hardships, the disappointments of failure time after time, before achieving some success, or suffered the ridicule of their neighbours and the masses generally, had not they been inspired by something greater than financial reward.

To be sure, such an attitude requires lofty ideals, but just because lofty ideals are required and because they are essential to success in any creative undertaking, are we required to speak of them only in a whisper, perhaps because we might be ashamed of them? If that were true, I wonder how many of you would risk your lives in the hands of a surgeon who gave no thought to you as a human being, no thought of the human compassion for others, and who only thought of the fee he would get for the operation, successful or not? It would be far better were he inspired only by the fame he would get for a successful operation than by the purely material rewards in money.

The reason I am stressing this need for idealism may not be obvious to you, but as head of the Engineering Department of a large corporation I have much opportunity to observe the differences in

engineers, and particularly to observe the attitude of the younger engineers just coming out of college. I feel certain that in many cases their attitudes are completely reversed from what they should be for their own best good. The bulk of the younger men specifically state the kind of work they like to do; few inquire into what assignments may be best for their own improvement. Then after they are located a short while they look about to covet some important position and become discouraged if they do not attain it at once. Few of them give very much consideration to the fact that they are not prepared for responsibility and authority. Then, too, I have observed those men who have become successful and, without exception, these men have been inspired by some ideal which makes them look primarily toward the development and improvement of their minds. The great scientist and engineer, Steinmetz, once said, "Improve your mind and do your best and the rewards will take care of themselves."

## NECESSITY FOR GENERAL INTEREST

In the automotive industry the engineer who directs the work must be a business man, artist, salesman, merchandiser, and engineer, and to do this he cannot have any compunction about those things which interest him and those which do not interest him; he must be interested in all things. It is not enough for him to confine his interest to the romance of intricate mathematical deductions; it is not enough that he be interested only in the technical manipulations in the laboratory, but also he must see romance in the prosaic matters of cost, and the relation of shape and form to methods of manufacturing. He must be just as much interested in the screws, nuts, and cotter pins, and the tolerances of screw threads and the fitting of parts as he is in the line and color which make up the aesthetic beauty of the finished car.

He must also possess a fluidity of speech which enables him to convince his management on the expenditure of large sums of money for the adoption of engineering programs. For the projection of those programs into the future for manifold duplication in production, he must be able to sense the public attitude and be ever alert to plan, design and engineer products which will be acceptable to the buying public. He must gauge economic conditions in order to determine what the product is to be which will be acceptable at the time the automobiles come off the production line.

It is evident from these manifold requirements of skill that the engineer's interest plays a great part in his success. Interest probably

is akin to curiosity, but, regardless what this quality may be, it must not be restricted in any sense. I find so many young men wanting to confine their activities after they come from college. Many of them want to do research work exclusively, and many express the desire for narrow specialization. Now, of course, if this indicates a capacity of mind, it might very well do for them to confine themselves according to their desires. It is certain, however, that such a confinement can lead few to the realization of high places.

For some unknown reason to me, young engineers fight against working in the designing rooms. They seem to detest draughting and seem to have no desire to attain skill in draughtsmanship. This is a sort of paradox, because draughtmanship to the creative engineer bears the same relation to engineering that language and composition have for literature. It is the language or means of expression by which the designing engineer develops and expresses his ideas. This perhaps may need a slight qualification, for I realize in some phases of metallurgy, creative thinking may be done without aid of draughtmanship, but it is highly essential to the mechanical engineer, electrical engineer, civil, and mining engineer. In view of its importance in engineering, it is hard for me to understand why so many engineering graduates look down upon this form of skill. In industry it provides a comprehensive education. Most men are not born skilled creators, and even before it becomes possible to do creative designing it is necessary to acquire a certain sense for arrangement and proportion, a sense which can be developed only by the labour and drudgery

*Fun and Games* *Flag Rush*

of serious application. I have seen some of the most ludicrous arrangements presented as designs because of a lack of this sense of proportion. I suppose that the quality of which I am speaking should be somewhat amplified. To begin with, it embraces more than proportion alone, for it involves also arrangement and that certain aesthetic sense which has for its object simplicity, directness and at the same time embodies the maximum performance potentially existent in the design. This quality also is based necessarily on a comprehensive technical knowledge on all of the related subjects which may be involved in a particular product, and may reach from the simplest and most prosaic elements of production to the complex phases of metallurgy or the nature of materials.

Here, you will notice, I keep dwelling on the knowledge of production methods, and here again is the subject which is usually passed over as uninteresting. Why? Some of the problems associated in making a product challenge ingenuity as severely as the most intricate problems in mathematics. I have read times without number the advices of prominent engineers who, with all the fervour at their command, urge graduates of technical schools to spend two or more years in the shops to acquire, not so much mechanical skill in the making of things, but rather to acquire knowledge of how things are made and knowledge of some of the problems occurring in production methods. Why this phase of the young engineer's foundation is neglected is probably not so difficult to understand as it probably is due, not so much to a lack of interest, as it is to over-valued appraisal of the knowledge he has learned in college, and I do not mean by this to disparage that which he has acquired in college. What I do mean is that this evaluation is set up on an intrinsic basis entirely and not in relation to the great fund of collateral knowledge necessary for its application. Then, too, perhaps the young graduate looks upon two or three years spent in the shop as being a hinderance to his immediate progress, but, although it may be a temporary hinderance in his getting under way, it will pay enormous dividends in his final progress toward success.

## Importance of Little Things

The importance of little things is a copy book bromide, repeated so often that it has lost most of its force, yet all things are an aggregate of little things. Why such paradoxical mental states should, on the one hand, accept for fact phenomena which are not understood and, on the other hand, dismiss as unimportant, or totally disbelieve, facts right in the open and requiring no further proof, is an enigma.

As an example, some years ago when the industry was making a serious effort to reduce cylinder wear, much testing was done to determine the effect of dust drawn into the motor through the carburetor. Air cleaners made their appearance as a result and many of them were not very efficient. But tests proved that, with an efficient air cleaner, less than one one-thousandth of an inch in wear in 25,000 miles could be attained. In another test without the cleaner in the alkali deserts of New Mexico, an engine was worn beyond useful service after forty miles, where the dust was as fine as flour. Yet in the face of these facts an engineer reported that the dust did not cause the wear and recommended against the air cleaner. His argument was that the dust particles were so fine that they could float in the oil film without causing wear. How could anyone draw such a ridiculous conclusion? This is a plain case of ignoring the real facts and accepting a nebulous phantasy. Of course, some oil film did exist, but how thick was it—one or two millionths of an inch or five thousand times larger, and how big were the dust particles, one or two mils or a thousand times smaller?

Perhaps only prejudice could have inspired such a conjecture to block reception to the idea of the air cleaner. To be sure, there were disadvantages to its use; the added cost of the unit was a considerable item and reduction of engine power and upset fuel-air mixture ratios were by-products that presented problems. But the greatest obstacle was the inability to understand why after so many years during which air cleaners were not used, that it should be suddenly found desirable and even necessary at the time. So, therefore, untenable reasons were conjured up to oppose the new idea.

## OPEN MINDEDNESS

This simple example brings before us another important quality of mind. Prejudice and bias are generally inspired by fear; they are perhaps part of the defense mechanism which guide cautious steps, but whether they predominate and thereby establish the reactionary attitude, or whether they inspire thoroughness of inquiry to prevent pitfalls in the path of progress, depends on the point of view. We have learned times without number that the only thing on earth which is constant is change. Things always are being done, which were said to be impossible, and yet new ideas always meet the same resistance. Perhaps the very rejection at first of the idea is the principal step which subsequently makes for success. But let us see how the point of view works.

Where a new idea is presented, the reactionary attitude seeks out its fault and then rejects it as impossible. Whatever it is, it won't work and that is the end of it. But with the other or constructive point of view the faults are sought out with equal diligence but with this difference: these faults are analysed dispassionately and with proper concern, for the purpose of eliminating them. What a totally different attitude it is to say: "Well, let's see, how can we eliminate the faults in this thing to make it work properly?" than to say: "This thing is no good; let's forget about it, because thus and so is the matter with it." Success requires, however, that these faults be honestly appraised and all of them uncovered.

But what is more important is the totally different effects which these attitudes produce. In the first case, something positive is accomplished. An idea or plan is tentatively accepted and, if the faults appear to be surmountable, something is done about them. The path is clear for new thoughts and ideas on how to eliminate the faults, and this ultimately leads to the successful culmination of the project, perhaps the birth of something great and far-reaching. On the other hand the latter attitude leads only to negation and nothing is done or accomplished.

The essence of all progress is probably derived more from revisions of attitude than all other mental qualities. If Columbus had accepted as final the notion of a flat earth, he certainly would have had no curiosity of why it happened to be flat and could not have been receptive to any other idea. But this does not mean that existing notions should be abandoned and replaced by every new idea that comes along. It simply means that old ideas or notions shall not be accepted as final and that rigorous proof and preponderant evidence must accompany the proposals of new conceptions or deductions.

New conceptions are inspired frequently by recognizing the faults which exist in our environment or in the attempt to explain the nature and behaviour of things, and as a result tenable premises must exist in a rational foundation for these new conceptions. Such are the things curiosity inspire. Frequently, of course, is the curiosity rooted in necessity. But regardless of this, if these new conceptions are in conflict with existing ones and before they can be sold to others who hold the contrary view, every factor entering into their acceptability must be scrutinized, and especially so, if the conception is founded on technical or functional advances solely. Deep-rooted social entities, like historic artistic predilections cannot be banished or changed over night to accept that which is based solely in scientific efficiency.

## IMAGINATION

One other element which I should like to touch on before closing is the great usefulness or importance of a well-developed imagination. For some reason, the word imagination is used so loosely that many people are ashamed to admit possessing such a thing, but this quality of mind is one of the essential elements of our civilization and is most essential to our progress, more particularly perhaps to the progress of the engineer than he is willing to admit. Why we do not provide better facilities for improved training of this quality of mind is perhaps answerable only in the amount of time available for an engineer's schooling. Practical imagination in the sense that it provides an almost instantaneous correlation of collateral knowledge involved in a given idea is highly essential in the work which an engineer does in his daily routine. Many problems cannot be solved without it. Let us take a simple case.

Some years ago we ran into a very disagreeable noise made in the oil pump of one of our models. An engineer was assigned to the task of eliminating it. This noise was not a symptom of trouble, but was merely disagreeable. By methods of elimination it was found that the noise was produced in the by-pass valve vibrating on its seat, due to fluctuations in oil pressure, and by substituting a rubber ball for the steel one the noise was completely eliminated. But a rubber check valve ball was not durable enough, and did not represent a solution. After much time and effort a solution had still not been

*Chariot Race, School vs. Meds.* *Varsity-McGill Game*

reached. One day an engineer, who was not working on the problem, came to me and said simply: "Colonel, did you ever try to insert a plug in a faucet with a full stream pouring out of it and notice how the plug is always pushed to one side? I visualize this check valve as doing the same thing and I believe if the ball is properly guided, the trouble will be eliminated." This was tried, with the exact result which he predicted.

This is the kind of imagination which is highly essential. It is the ability to envision, in substance, ideas and their relation to existing experience. It is that ability which permits the fullest anticipation of the effect of an idea or the behaviour of the embodiment of ideas in practice, and, in its greatest creative sense, it is the ability of mind to plan and contrive new designs, new methods, or new applications based on existing facts and existing knowledge.

I might say in closing that the motor car, or the industry built upon it, is not the only object lesson at our disposal, but it does possess in such a compelling manner the romance of engineering endeavour—a great romance rooted in adventure, curiosity, widespread interest, plasticity of mind, and imagination.

# The Trolley Bus in Municipal Transit

BY T. L. COOKE, JR.

*Entry in the Student Paper Competition held at the joint meeting of the Engineering Institute of Canada, Toronto Branch, and the Engineering Society of the University of Toronto, on February 24, 1938.*

The trolley bus is the newest of public transit vehicles and is fast becoming the most popular. In 1930, there were only 200 of these coaches in the United States, but at the end of 1937 there were 1,270 in operation, with half that number again on order. What is the reason for this increase? In order to understand it, it is necessary to take into consideration, first, what the trolly coach is, second, how it has developed, third, what its place is in public transit to-day.

## WHAT IT IS

The trolley bus, or trackless trolley, is a cross between a trolley car and a gasoline bus. It resembles the motor coach in body design, but the trolley car in drive and control. It receives power for its d.c. series motors through trolleys running on two overhead wires. Two are necessary, since there is no track to serve as a ground as in the case of the street car. It must follow the path over which the wires are placed, but it is free to move, on the average, twelve feet to each side of the wires. Hence, it is more flexible than the trolley car, less so than the bus. The capacity of most models is between 30 and 42 passengers seated, but in England, double-decked types are used which have a seating capacity of from 70 to 100.

## DEVELOPMENT

Early models were patterned after street cars, and were usually employed in routes for which tearing up the street to lay tracks was too expensive or caused too great disturbance to existing sub-surface works. These early vehicles were uncomfortable, since they had hard rubber tires, and ran on streets that were paved none too smoothly, so that they were never very popular. The Toronto Transportation Commission tried trolley coaches in Toronto, but abandoned them for these reasons.

With developments in the motor coach, however, many improvements were made available to the trolley bus. Pneumatic tires increased riding comfort, as did the better paving of the streets for use by automobiles. Development in body design, steering control, braking, and light-weight motors all resulted from researches done for the motor coach.

The first models were powered by 50 h.p. motors, but later models employed two 65 h.p. motors with series-parallel control similar to that in traction equipment. The tendency now is toward single-motor drive, with a motor of 125 h.p., since this drive is lighter than the corresponding twin-motor drive, and has a lower first cost and maintenance cost. It also simplifies control and eliminates much control wiring.

That the trolley coach is a modern development can be seen from the fact that 78% of all trolley buses in operation at Jan. 1, 1937, had been purchased in the previous five years, whereas only 3% of the street cars and 45% of the gasoline buses in operation at that time had been purchased in those previous five years.

## ITS PLACE IN PUBLIC TRANSIT

The application of the trolley coach is limited, but the limits are wider than most people realize. The trolley coach can never replace the street car or rapid-transit car where heavy rush-hour loads have to be carried. Their capacity is much smaller, so that a greater number of units would have to be used to carry the load. For example: a Yonge street car and trailer will carry, fully-loaded, about 300 people during rush-hour, whereas the capacity of the trolley coach would be about 60. Thus, five trolley buses would be necessary to replace one "train" of street cars. Obviously, this would require too much extra equipment for use only during rush-hour. Also, the headway, or time interval, between buses would have to be so short as to be a serious hindrance to traffic. However, on a light traffic line such as Sherbourne street, where the headway is about seven minutes, the trolley coach would be excellent, and the removal of the tracks would open another much-needed north-south traffic artery.

As compared to the motor coach, the trackless trolley is not as flexible. Operating along a given route, it has advantages over the gas bus in quicker starting, smoother and quicker acceleration and braking, but the route is fixed and in districts such as suburbs where the route is likely to be changed very often, the motor bus is the only

thing to use. Also, the trolley coach has a constant charge in the form of the overhead wiring, and there must be sufficient traffic on the line to bring down the effect of this charge on the expense per mile of operation.

Thus, it is seen that the place of the trolley coach is between the street car, which is the most suitable carrier of heavy traffic, and the gasoline bus, the most flexible unit of transit and one most fitted for lines having irregular loads and routes.

It is interesting to note that Public Service Co-ordinated Transport of Newark, New Jersey, has a fleet of 194 "all-service" vehicles, which are trolley coaches with an added Diesel-driven motor-generator set, so that they may operate as trolley coaches on the overhead system, or as gas-electric buses on routes where there are no wires. They combine, therefore, the advantages of the trolley coach and the gas-electric bus. The illustration shows one of these vehicles.

## ECONOMY OF THE TROLLEY COACH

Of prime importance in any engineering or business enterprise is the economy which the proposed change will effect. Thus note the


*Trolley Coach of the "all-service" type used by Public Service Coordinated Transport, Newark, N.J.*
*(Courtesy of Transport Journal)*

reasons why the trolley coach is more economical for many cases. The large majority of present trolley bus operations are replacements of street railway service on light traffic lines. When the replacement was made, there were two choices for the new service; trolley coach or gasoline bus.

With the trolley coach, as compared to the gasoline bus, the chief saving is in operating expenses as fuel and oil, maintenance, garage expenses, etc. Also, there is a saving in depreciation, since the trolley coach is much more reliable and has a greater life than the motor coach, so that few spares are needed. The savings can be further detailed; the cost of power per coach-mile for the trolley coach is much less than the cost of fuel and oil for the gas bus; since the engine and transmission are eliminated, there is a saving in chassis maintenance; since the crankcase and fueling are eliminated, there is a saving in garage expense. There is the additional cost of overhead wires for the trackless trolley, however, but this is overbalanced by the savings listed partially above.

Many transit companies generate their own power, and when they replace trolley cars by buses, they suffer a loss of load which makes their power cost per car-mile higher. By using trolley-coaches, this loss is offset, since these units take up the load dropped by removing the street cars. The average trolley coach represents a load of 85,000 to 100,000 kilowatt hours per year.

With trolley coaches, regenerative braking can be employed, which not only returns power to the line, but at the same time practically eliminates mechanical braking, with its accompanying replacements and maintenance. Regenerative braking is used widely in England.

Compared to street cars, trolley buses save money, since they eliminate track and paving renewals and maintenance, which more than compensate for the additional cost of placing and maintaining two wires instead of one. Therefore, if the traffic is such that the trolley coach can carry it without an undue amount of extra equipment for rush-hour, it is definitely more economical than the street car or the gas bus.

## Public Good Will

Transit companies go to a great deal of trouble to obtain the good will of the public, that it may be "transit conscious", and use the public service rather than clutter up the downtown areas with private vehicles. The public likes trolley buses, and their use increases business not only

on the line on which they are placed, but on all other transit lines. The reasons why people like them are many. The trolly bus has the advantage over the street car, since it can load up at the curb. Thus passengers avoid the dangers of crossing traffic before boarding and after leaving. The coach is quiet in operation and smooth in acceleration and braking; there is no jerking as gears are shifted, and no nauseous fumes as in the gasoline bus.

Since the trolley bus can move from side to side, from the curb to the middle of the street, it does not block traffic when loading or discharging. There are no tracks which make driving treacherous in wet weather. Also, since it is so quiet in operation, it is welcomed in places, such as hospital zones and near music halls, where quiet is necessary.

Since the trolley coach can move in and out of traffic, it can travel much faster than the street car, and make better time. Also, it has been found that the trolley coach, with its high rates of acceleration and deceleration, is capable of speeds 10 to 15% higher than those of gasoline buses in the same service. The average trolley coach has a free running speed of 35 to 40 miles per hour—much higher than average traffic speed.

Safety, speed, quietness and smoothness of operation—all these factors help build public good will, and with increased good will comes increased traffic and revenue.

Thus, because of its economical operation and maintenance and its popularity with the public, the trolley coach is destined to have a prominent place in the public transit picture of the future, and it is hoped that Toronto will avail herself of the opportunities afforded by this newest of transit vehicles.

# The Engineer in Society

BY BERNARD ETKIN

*First Prize Essay in the Engineering Society Essay Contest, Junior Division.*

I think that a man could have no worse a sensation than to feel that Society does not need him, that he is useless, and is not contributing in any measurable way to "making the world go 'round", so to speak.

This was one of the prime considerations which actuated me to choose engineering as a life's work, for as an engineer, I could feel that I had a real life's work, one which could bring me satisfaction and at the same time serve a useful purpose in society. I am sure that many of my fellow students here share this sentiment with me.

The place of the engineer and applied scientist in the progress of the world and the development of our modern civilization has been a very important one in the past, and is becoming more so, year after year. It is the mechanical engineer who is responsible for both the manufacture and upkeep of the machines which constitute one of the chief characteristics of this era "The Machine Age". It is the electrical engineer who supplies light, power and heat to the homes and factories of the world, it is the civil engineer who builds the bridges and the towers which cover the country, the mining engineer who brings forth from the depths of the earth, all the useful and precious minerals in which nature is so rich. The architect designs the homes we live in, the schools we study in, and the factories in which we work. He leaves in his work a reflection of the art of his period. The chemical engineer is the guiding spirit behind a vast and most amazing array of products from soap to nitro-glycerine. It is needless to dwell further here on what engineers do. You all know at least as much about that as I do, except to note that everywhere we look, in everything we do, from the simplest of conveniences to the motors which drive the wheels of industry in all the little and the big things to which we are so accustomed and which so affect our lives, is manifested the work of the engineer. He is a creator. Indeed, his work so vitally affects the mass of the people, and contributes so enormously to all those things which characterize the present-day mode of life, that we might almost say he moulds society.

It is the function of the engineer, you see, to adapt to the everyday world, to the needs of to-day, and of tomorrow, the knowledge and the discoveries of science. Without the engineer, science would be futile, for nothing deserves to exist in society which does not serve the needs of the people, and which does not have a beneficial effect on their condition. This applies very well to science and to mathematics. Newton, Gallileo, Dalton, and the late Lord Rutherford would all have wasted their time if the truths which their hard work and brilliant experiments uncovered, had remained truths only, and had not grown to be anything more, buried in books of knowledge and in the science laboratories of the world. Scientific investigation purely for knowledge itself is a waste of time and energy. Truths for their own sake are not enough. For example, if it were not for the fact that Ohm's Law now forms the basis of a great many calculations in practical problems in electricity, George Simon Ohm might just as well have taken up music as to have spent his life studying electrical phenomena. He might have been of some use in that case. Of course, it is fortunate that he did not.

That is where the engineer steps in. It is only when he takes the work of the scientists, and by mathematics and wizardry of ingenuity uses it to produce those things which are raising the standard of living of mankind, and which make life a pleasure instead of a labour, that the work of the so-called "Academic Scientist", finds a useful and important place. So we may look up to Mr. Ohm and respect him, as indeed we may all academic scientists, since he discovered something which we have been able to put to use, as the engineer, being a practical man, judges things on the basis of their usefulness.

As in the production of boots and shoes, and of doctors, so we can trace the existence of an engineering profession to the law of supply and demand. The people demand conveniences, better tools, better homes, in short, a better way of living. The engineers have sprung up in the past half-century or so to supply these requirements. That is the job of the engineers. We are studying here so that we may be able to help fill that demand, so let us always try to remember when we are out in the world, just why we are there, what is our duty, and why our existence is justified. May we never become parasites and leeches, riding on the backs of those under us, but to make the name "Engineer" respected.

# The Application of High Temperatures and Pressures to the Steam Turbine

BY J. LAIRD HEMPHILL

*Co-winner of Second Prize in the Student Paper Competition held at the joint meeting of the Engineering Institute of Canada, Toronto Branch, and the Engineering Society of the University of Toronto, on February 24, 1938.*

The steam turbine is to-day one of the chief sources of electrical power, particularly in many sections of the United States and Europe. The problem of increasing the efficiency of the turbine and the power plant has become increasingly important with the rising cost of fuel.

The steam turbine operates on the Rankine Cycle or some modification of it. The two main cycles used are the Regenerative Cycle and the Reheat Cycle. In the Regenerative Cycle, steam is tapped off or bled from various stages of the expansion process and used to progressively reheat the boiler feed water to as nearly as possible the boiler temperature. In the Reheat Cycle, in addition to the regenerative process, all of the steam is reheated after partial expansion in the high pressure element of the turbine and then passed through the low pressure element and expanded down to the condenser pressure. The regenerative process increases the efficiency of the cycle by making the production of steam in the boiler more nearly an isothermal process and the reheating enables higher steam pressures to be used without having excess moisture in the exhaust steam.

The efficiency of any thermal process can be expressed simply by the equation:

$$E = \frac{Q_1 - Q_2}{Q_1 - q_0}$$

in which

$Q_1$ = Total heat content of the supply steam,
$Q_2$ = Total heat content of the exhaust steam,
$q_0$ = Total heat content of the condensate steam.

There are certain practical limitations to these quantities when applied to the steam turbine process. The minimum exhaust temperature and pressure economically available with the usual cooling water temperature is approximately 80° F. and 1 in. mercury absolute. The

maximum amount of moisture permissible in the last stages of a turbine is about 10 to 12%. The maximum safe temperature limit that that can be used with the materials at present available at a reasonable cost is about 1000° F.

Thus it can be seen that, for the above cycles, even in their most ideal form, more than 50% of the available energy in the steam is dissipated by the cooling water in the condenser. For this reason the principal technical and thermal advances in the economy of power generation must be made through advances in the inlet temperature and pressure.

There are many advantages to be gained by using steam at higher temperatures and pressures for the steam turbine.

(a) By providing a greater temperature range between the inlet and exhaust conditions, more energy is made available for transformation into work for specified exhaust pressure.

(b) Because the energy is supplied at a higher temperature and decreased entropy, a larger portion of the available energy can be utilized.

(c) The steam at higher temperatures is more gaseous in nature and has a lower conductivity, thus decreasing the losses due to fluid friction and conduction in the piping and turbine nozzles.

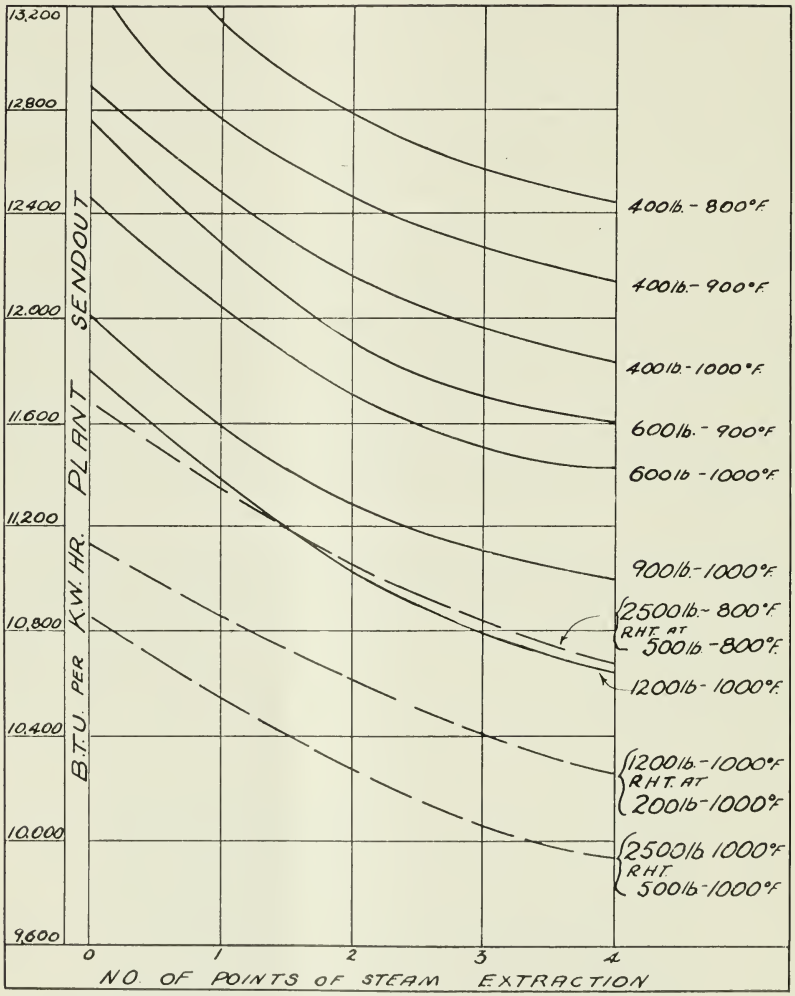
Considering 1000 to 1100° F. as the present economical maximum temperature at which the steam can be safely handled, the maximum

*Advance on Hart House* *Election Day*

pressures that can be used, with the limit of about 12% to the moisture content of the exhaust steam, is approximately 1200 lbs. per sq. in. for the straight condensing or regenerative cycle and about 2500 lbs. per sq. in. using one stage of reheating.

It might clarify some of the statements previously made if more detailed reasons were given for limiting the moisture content of the exhaust steam. It is obvious that, from a strictly thermodynamic point of view, the greater the moisture content of the exhaust steam, the greater would be the efficiency of utilization of the heat energy of the steam. This would reduce the loss of the heat of vaporization of the steam which is dissipated by the condenser cooling water. The small droplets of water contained in wet steam when impinging on the turbine blades cause erosion and wear of the blades, destroying their shape with a resultant loss of efficiency. This erosion increases rapidly with increases in the moisture content of the steam and the peripheral blade speed. There is also an energy loss due to mechanical interference between the moisture drops and the steam. The velocity of the moisture drops carried in the steam is about 75% of the steam velocity and thus causing shock and drag losses when flowing past the blades.

The increase in efficiency made possible by the use of higher temperatures and pressures has not been without some attendant difficulties. The principal difficulty in handling high temperature steam, and the one that still limits the economic temperature limit that can be used, is the producing of metals at a reasonable cost which will retain sufficient strength when used at temperatures of 1000 to 1100° F. This is especially important in the superheater tubes and piping, which are exposed to the maximum temperatures and pressures in the system. Here the best results have been obtained with an 18-8 austenitic nickel-chrome steel. Turbine blades are usually made of 12-13% chrome stainless steel or chrome nickel steels in the high pressure element. The use of higher temperature and pressure steam has necessitated the use of higher blade speeds, 1200 ft. per sec. being not uncommon at the exhaust end. To prevent excess erosion of the blading, shields with a hardness of 500 Brinell have been used on the back of the inlet edge of the blades, stellite being the metal most commonly used. The mechanical design of the glands and packing of the high pressure element has required much care so as to prevent excess leakage and to prevent seizure of the rotor at the high temperatures. Another place that has required much care in design is the lubrication system to prevent any




SUMMARY OF PLANT PERFORMANCE FOR STEAM CYCLES
(COURTESY OF A.S.M.E.)

possible contact between the lubricant and the higher temperature steam which would result in a costly fire.

During the last few years one of the most popular methods of increasing the capacity of a power station and also increasing the efficiency due to the use of higher temperature and pressure steam without an excessive capital outlay is by the use of superposition. Superposition, as applied to the steam turbine, is essentially the cross-compounding of a new high pressure turbine with an existing low pressure turbine. A new high pressure boiler is provided to produce steam for the high pressure turbine which exhausts into the old low pressure turbine, usually through a reheater to provide more stable steam conditions at the low pressure turbine throttle over a wide load range. The amount of superposed capacity that can be added depends entirely on the size and steam conditions at the throttle of the old turbine. The greater the amount of superposed capacity that is added the greater will be the saving in fuel costs per kilowatt hour. In some instances, the capacity has been increased about 90%, with a reduction of about 40% in the plant heat rate.

A comparison of the plant heat rates obtainable with various initial and reheat conditions for the steam is shown by the accompanying curves. These show the marked reduction in the plant heat rate that is obtainable by increasing the temperature and pressure of the steam. With steam at 400 lbs. per sq. in. using two stages of extraction, which is about the most economical number, increasing the temperature from 800 to 1,000° F. shows a reduction in the plant heat rate from 12,800 to 12,170 B.T.U. per k.w.h. Similarly, with 3,600 lb. steam and two stages of extraction, the reduction is from 11,900 to 11,700 B.T.U. for a temperature increase from 900 to 1,000° F. The curves for 2,500 lbs. per sq. in. are included to show the economy of operation that will be possible with such an installation when the materials are available to produce the equipment at a reasonable cost.

(Curves from paper by G. A. Gaffert, Trans. A.S.M.E., 1934.)

# The Passing Show

BY PROF. A. R. ZIMMER

The suggestion that the writer prepare a short statement comparing conditions to-day with those of his undergraduate days came as a bit of a shock, because it takes one back to the time when the "Little Red School House" (Engineering Building) provided accommodation for most of the work carried on by what was then known as the Ontario School of Practical Science. Usually we prefer to forget how quickly the years are passing and when one is brought face to face with the fact that it is more years than he cares to remember since his freshman days, it must be admitted "shock" is the word that expresses one's feelings. During the intervening thirty and more years great changes have taken place, such as University affiliations, building space, curricula, numbers of students, and the many social adjustments due to the progress in our general living conditions. For instance, as an illustration of progress, the old bicycle racks which formed an essential part of the equipment for each building and which were the innocent cause of many an interfaculty scrap, have given place to "No Parking" signs.

About the beginning of this period, in the year 1906, the School of Practical Science ceased to exist officially because it was then that it became the Faculty of Applied Science and Engineering, in the University of Toronto. Despite this change in the relations with the University, the designations "School" and "S. P. S." have persisted and will no doubt continue far into the future. Probably we, of to-day, do not realize or give sufficient thought to the foundation that was laid in those early years and upon which our present complex organization is built. Referring to a criticism that a "proper, vital *esprit de corps*" was lacking among University graduates and undergraduates, the Engineering Society publiction "Applied Science" of January, 1908, had this to say: "One thing is certain, however, that it is not true of the 'School'. Once a School man, always a School man, seems to have been the motto. The reason for this is obvious. The men in the Faculty of Applied Science have a better opportunity of becoming acquainted with each other, in the field and drafting rooms, than those in other faculties. Again in early days, when attendance was small, we had to make a fight for recognition. 'Toike Oike, Toike Oike' often assembled the boys either to battles of offence or defence when, shoulder to shoulder, they fought for the honour and glory of the School. Just how much effect these scraps had on the cementing of friendship and the arousing

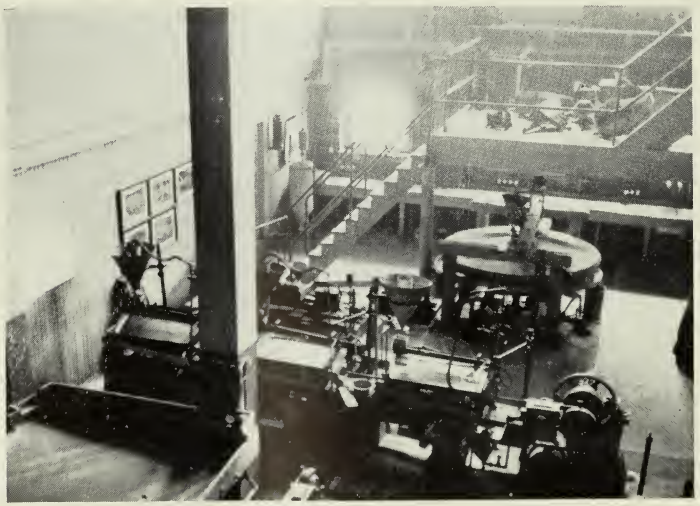
of that feeling of mutual help which all School graduates carry with them into the world is hard to say, but that it has had some no one will deny." The purpose of this quotation is to indicate how the unifying influence of close association, the willingness to co-operate and the resulting mutual understanding were welded together to form what we call "School spirit".

Then came the growth and development of our faculty, with new buildings, Mining Building, Mechanical Building, Electrical Building and recently the Mill Building, in order of construction. The result has been a separation of departments, until we find a situation where students in one department know comparatively few students in another department. Along with the increase in laboratory accommodation in new buildings have come curriculum revisions which, no doubt, have played a part in widening the gaps between student groups. Also, the division of the Engineering Society into the various clubs has given the student a centre of interest and activity which naturally tends to diminish his concern for the larger group. Speaking of the Engineering Society, it should be noted that in the early years of the Society many of the papers were presented by the student, whereas to-day very few papers, if any, are prepared by undergraduates. We should be careful, therefore, to see that, along with the gain in efficiency due to improve-

*"Dirty Med" Election Day*

ments in laboratory space, curricula and student organizations, we maintain that sense of unity which has been one of the outstanding features of the "School" in University life. The idea behind "School Nite", an innovation of comparatively recent years, indicates a step in the right direction.

During these passing years the writer has had the privilege of having fairly close contact with most of the students of our faculty and has no hesitation in saying that they measure up to the standards set by the best traditions of the School. Also, despite the increasing number of student activities outside of studies prescribed by curriculum, there is more academic work accomplished to-day than in the "good old days".



*Ore Dressing Laboratory*

# The Steam Locomotive

BY ARTHUR L. GUESS

*Third Prize Essay in the Engineering Society Essay Contest, Junior Division*

The modern steam locomotive is one of the marvels of engineering. It can produce more power than a stationary power plant several times its size, and also haul its own supply of fuel and water. The modern locomotive is indeed a far advance from Cagnot's engine of 1769. This vehicle, running upon a public highway, overturned at a speed of three miles per hour, and was locked up as a menace to the public safety.

The first steam engine to run upon rails was constructed by Richard Trevethick in 1802. It was used in hauling coal from a Welsh colliery. It remained, however, for Robert Stephenson to produce the first really successful locomotive. This was the "Locomotion", which he built in 1825. This locomotive embodied practically every feature of the modern locomotive, and was used on the Stockton and Darlington Railway, which was the first railway built for conveying freight and passengers for the public.

The success of this first railroad quickly led to the building of railroads throughout the world, especially in North America. Because of different operating conditions, American locomotives developed along slightly different lines from the European, so we will confine ourselves to the former.

As railroads gradually spread throughout America, the great distances to be covered led to a demand for more speed. This was accomplished at first by increasing the diameter of the driving wheels, but this decreased power. The valve gear finally solved the problem. At first the "Hook Motion" was used, but this was not entirely satisfactory. It was soon replaced by the Stephenson link mechanism. But after 1900 when motive power increased in size, it also was found unsatisfactory, and was displaced by the Walschaert valve gear. This is used on most modern locomotives, as is the Baker valve gear. In Europe, the Caprotti valve gear finds favour. This uses poppets instead of slide and piston valves. However, it has not proved successful under American conditions.

Originally all the power of the locomotive was concentrated in one pair of drive wheels. Soon, however, two pairs of drive wheels were

used, the drive wheels or "drivers" being connected on each side by side-rods. This necessitated the use of counterweights on the drivers.

There was little demand for heavy locomotives in the early days, for although a heavy train could be started, it could not be stopped. The development of the compressed air brake in 1873, and the invention of the Junney automatic coupler about the same time made heavier trains possible.

An outcome of this was the increase in the number of drive wheels in the locomotive. Prior to this time, the usual type of locomotive was the "American", with a four wheel leading truck and two pairs of drivers. This was used in both passenger and freight service, and could not handle more than twenty loaded cars.

Now the "Mogul" type appeared. This had a leading pony truck of two wheels, and three pairs of drivers. It was followed by the "Consolidation" type, which had a pony truck and four pairs of drive wheels. These were used in freight service extensively, and exist in large numbers even to this day.

In passenger traffic the "Ten-Wheeler" type of locomotive appeared. This had a four wheel leading truck and three pairs of drivers. It was soon found, however, that in spite of the increased size of the boiler, not enough heat was developed by the firebox. This had been set between the drivers and was narrow therefore.

The trouble was finally solved by adding a pair of trailing wheels behind the drivers to carry the weight of the firebox, which was then made as wide as the boiler. The "American" type was then modified by this addition to the "Atlantic" type, the first of which was used by the Atlantic Coast Line in 1892. The New Zealand government railways ordered a locomotive with a wheel arrangement of the "Ten-wheeler" with a pair of trailing wheels added. Some of the first of those built for domestic use were sold to the Missouri Pacific Railway, and thus gave this type the name "Pacific". Until recently they were used in all fast and heavy passenger service.

The demand for higher capacity in freight locomotives now appeared, and the "Mogul" and "Consolidation" types were altered to the "Prairie" and "Mikado" types by the addition of a pair of trailing wheels. The "Prairie" type was never popular, but the "Mikado" type has been the leading freight engine in America since that time.

The increasingly exacting demands upon locomotives led to the addition of a pair of drivers to the "Pacific" type to make the "Mountain"

type, first used in the Rocky Mountains. An extra pair of drivers was also added to the "Mikado" type to produce the "Santa Fe" type.

The "Mallet" types of locomotives also appeared at this time. They had two sets of drive wheels, each driven by a separate set of cylinders. These cylinders were compounded. So that it could run around curves, the boiler was jointed in the middle, and both sets of drivers rigidly attached to the boiler. This type was endured for several years as a necessary evil, but is now practically extinct. They were expensive to build and expensive to maintain, and could not travel faster than fifteen miles per hour. Of note is the largest of these, which was built for the Erie Railroad. It had three sets of eight drivers each, and could haul two hundred loaded coal cars. It was a noble failure, and was scrapped four years after it was built, along with its brethren.

Fuel economy has always played a notable part in locomotive construction and operation. To this end, compounding was tried at the beginning of the century. This was always expensive to maintain, and necessitated higher boiler pressures. After ten years it disappeared, but the higher boiler pressures have remained as an aid to economy.

Superheating made compounding unnecessary. The superheater tubes run inside the boiler tubes, and the steam in them is in direct contact with the flame and is heated considerably. All modern locomotives are superheated.

Heating the feed water is another measure for economy. Originally the boiler pump was driven from the driving wheel axle, and could be used only with the locomotive in motion. The injector replaced it about

*Hart House Dinner* *Election Day*

1870. This forced the water into the boiler by increasing the velocity. It was replaced by the feed pump, which was worked by steam drawn from the boiler. This was more economical on steam and water. At present, the exhaust steam injector is finding favour, as it condenses part of the used steam and transfers its heat to the feed water. Tubular, exhaust steam, feed water heaters are also used extensively.

The demand for higher speeds in locomotives led to the use of a four wheel trailing truck to support the larger firebox. The "Pacific" type was thus converted to the "Hudson" type. As an outstanding example of these, we may consider the "5700" series of the Canadian National Railways. These, because of their ample firebox and boiler, and the excellent proportions of their boiler, can travel as fast as anyone can desire if not loaded too heavily. Their top speed is probably around 125 miles per hour.

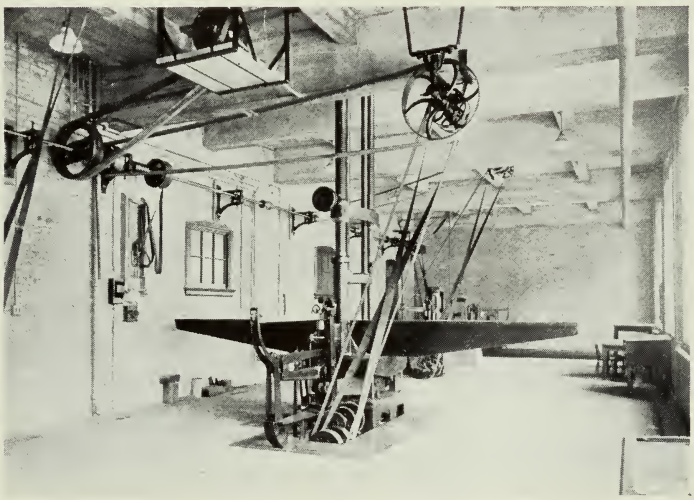
Another example of very recent locomotive design is the "Jubilee" type of the Canadian Pacific Railways. These cannot handle such a heavy load or accelerate very quickly, but are very efficient at high speeds, as it has only two pairs of drivers, surpassing a speed of two miles a minute without difficulty. Only the limitation of the roadbed prevents higher train speeds. It will be noticed that a steam locomotive can travel as fast as any Diesel electric locomotive.

The present demand for fast freight service has led to the development of the "Northern" type. This has leading and trailing trucks of four wheels, and four pairs of drive wheels. Because of its size and also the generous proportions of the firebox, boiler, and superheater, it can haul heavy freight at passenger train speeds. The railroads realize this, and orders for this type exceed in number those for all other types.

Of late the "Challenger" type of locomotive finds favour in the United States. It resembles the "Hudson" type, but has two sets of three pairs of drivers instead. However, the boiler is rigid, and the front set of drivers swivel like a pilot truck. It combines the speed of the "Hudson type with the power of the "Mallet" type, and can, under good conditions, haul one hundred and fifty loaded cars a mile a minute.

This cannot be called a comprehensive survey of modern locomotives. It has touched on some of the more important points. One thing to be noticed is that the modern use of high boiler pressures,

large fireboxes, extensive superheating and high speeds has made over half the locomotives at present in service obsolete. The Diesel-electric and electric locomotives will never replace the steam locomotive, though each has its place. And finally we will note that, for mass transportation, the steam locomotive provides the most flexible, efficient, and cheap means of motive power available.



*General Testing Laboratory*

# The Course in Engineering Physics

BY PROF. C. R. YOUNG

*Chairman, Committee Administering the Course in Engineering Physics*

Following a prolonged investigation and innumerable committee meetings and conferences, the course in Engineering Physics was established, effective with the session 1934-35, with twelve students entering the First Year. The entering class has remained fairly constant in size, numbering sixteen in the present First Year. Special requirements for admission are imposed with a view to ensuring that those entering upon the course are sufficiently mathematical-minded to be able to profit from it.

## OBJECTIVES OF THE COURSE

Conversations with employers of technical men, supplemented by general observations, have indicated a demand for a limited number of graduates thoroughly trained in mathematics and fundamental science to undertake research and investigational work. While the field of employment for those who have received the regular type of engineering training is much more extensive than it is for those who have been trained in a course midway between pure and applied science, there is nevertheless a field for the latter. There are always those whose interests lie rather in original investigation than in routine design, production, supervision or management. Not all technical graduates do their most effective work in the more commonly occurring types of employment. Some do not reach their highest achievement unless given a comparatively free rein outside of the regular routine of design and production.

While a course looking to intensified application of mathematics and fundamental science must in a sense be somewhat restricted in its field, every effort has been made in the formulation of the course in Engineering Physics to provide for the inevitable cross-over in employment that occurs upon graduation. Very frequently, the student who specializes in the work of one department finds his life employment in that of another department. For example, few men now employed in the Westinghouse Laboratories at East Pittsburgh are working in or even began their industrial research in the same field as that of their college specialization. According to Dayton Ulrey, of the Westinghouse Laboratories, who has made a careful inquiry of the situation in other large industrial laboratories, of sixty-four industrial physicists who

have completed one or more years of graduate work, only nineteen, or less than thirty per cent, began their industrial research in the same general field of physics as that of their graduate specialization, and only seventeen of these are now in such a field.

## Employment

Of particular interest to the prospective student in Engineering Physics is the matter of employment subsequent to graduation. So far as can be seen at present, the opportunities are good for a limited number of graduates, but it must be understood that the field is by no means so wide as that offered to those who receive their training in the older and more conventional professional engineering departments.

For those who look forward to employment in the field of electricity there are opportunities arising from time to time in the research laboratories of the large manufacturing electrical companies, in those of the public utilities, and in the offices of consulting engineers specializing in power development. Those interested in communication may find employment with the telephone and telegraph companies, electrical manufacturing companies, Canadian Broadcasting Corporation, private broadcasting stations and aerial navigation companies.

For those who have given special study to X-rays and spectroscopy, employment is possible in research laboratories where the theory and practice of electron tubes is of basic importance. X-ray examination of metals in structures and in welded joints is growing in importance. Spectroscopic estimation of small amounts of metallic impurities is in many instances replacing ordinary chemical determination.

Graduates who have specialized in geophysics may find employment with the commercial geophysical companies doing contract work, with the mining companies, with the power companies, bureaus of public roads, and other organizations using geophysical methods for determining the nature of sub-surface materials in connection with foundation construction, for the supply of materials of construction or for the grounding of conductors.

In the field of applied hydromechanics, which includes aerodynamics, employment may arise with companies manufacturing aircraft, particularly where designs prepared abroad have to be modified to suit Canadian conditions. Executives of such manufacturing plants and the executives of such aerial navigation companies might well profit from training

such as is given in this option. The research laboratories concerned with aerodynamics can very well absorb a limited number of men so trained.

Those giving particular attention to elasticity of materials and structures might find suitable employment with the fabricating steel companies in the manufacture of tanks, pressure vessels, penstocks, pipes and bridge and building work. The aircraft manufacturers, particularly those of all-metal craft, would find such men highly useful. Opportunities also arise with departments of works, with consulting engineers, or in governmental research laboratories or the laboratories of public utilities.

Those pursuing illumination and acoustics might reasonably expect employment with the manufacturers of lamps or lighting equipment, with municipal, highway, railway and airway lighting departments, with public and private testing laboratories or with consulting illuminating engineers. On the acoustical side, employment is possible with the manufacturers of acoustical materials, with sound engineers in moving picture and radio broadcasting companies, with the testing laboratories and with consulting engineers.


*"Genevieve"* *Election Day*

# Department of Mining Geology

BY DR. E. S. MOORE

*Chairman of Committee on Mining Geology*

The academic year 1937-38 saw teaching started in a new Department in the Faculty of Applied Science and Engineering. The creation of this new Department was the outcome of the opinions of graduates of the "School" and others who had the welfare of the Faculty at heart. They felt that it would be desirable to have a course bridging the gap between the Arts courses in Geology and the Mining Engineering course. The recent trend of events in the growing mining industry calls for a corps of field men and mining geologists, in addition to mine operators, mill operators and metallurgists. The field scout and the mining geologist require a greater knowledge of geology than the average mining engineer, and in order to supply men so equipped, the Department of Mining Geology was organized.

The course has been so designed that the men taking it get an engineering training in mathematics, surveying, chemistry, drafting, etc., learn the elements of mining, ore dressing, metallurgy and assaying, and at the same time receive specialized training in the field of geology. The first two years of the courses in Mining Engineering and Mining Geology are the same, the students in the two departments taking all their work together. In the third and fourth years the students in Mining Geology take less mining, ore dressing, metallurgy, etc., but more geology than the Mining Engineering students. In other words, the course is the equivalent of an option for those students in Mining Engineering who find that their interests lie in the direction of the field engineer or geologist rather than the mine operator or mill man. The work which the Mining Geology student takes not only gives him a working knowledge of the subject of Geology, but it also puts him in a position where he can take post graduate work in Geology on an equal footing with the Arts graduates.

Students in Mining Geology are required to put in at least six months in practical work such as working in mines, mills, smelters or on geological work. They are advised to do at least half of this work in a mine, as it is felt that men engaged in any branch of mining should have some experience in underground operations. This requirement of practical work is similar to that in force in other Departments.

The administration of the Department is in the hands of a committee, whereas most of the other Departments in the Faculty are directed by a Professor. Apart from this the Department of Mining Geology is on equal and identical footing with all other graduating Departments. Graduates in the new course receive the same degree as the graduates from the other Departments, i.e., the B.A.Sc., and they can proceed to the graduate degrees of M.A.Sc., Ph.D., or the professional degrees such as M.E., C.E., etc., in the same manner as other graduates.

There is a misapprehension in the minds of some students concerning the type of work that the graduates in Mining Geology can qualify for, and also over the question of whether or not they can call themselves Mining Engineers. The answer to the latter question is quite simple if we restrict the use of the term to those who have professional degrees, for there are not over a score of men with the degree of Mining Engineer from this University. If we do not so restrict ourselves the answer is more difficult. No young graduate leaving this institution should call himself an engineer. It is not the function of the University to turn out engineers, and it does not do so. It does, however, supply the mental equipment that helps its graduates to become engineers after they leave the University, and if they follow the practice of engineering. The point at which the embryo engineer becomes a full-fledged Mining Engineer has never been defined. Perhaps it is when he is admitted to the Mining Branch of the Association of Professional Engineers. In that case anyone who can so qualify can call himself a Mining Engineer, irrespective of which course he graduated from.

The type of employment which a graduate can expect to get is always a serious question for the undergraduate, more especially in the case of a new course. It is expected that many of the graduates in Mining Geology will find work with exploration companies, prospecting syndicates, government geological surveys or in the geological departments of mines, but they are not bound to confine their activities to these spheres. In all probability, many of them will take jobs underground or on the survey staffs of the mines while waiting for openings in one of the above fields. If such openings do not materialize as soon as expected, they may find themselves becoming operators and getting away from the geological side of the work.

It is in this way that many men of the industry came into their present positions. Others forsook the work in which they had been

trained and entered on other fields, in which they have been highly successful. They were men of ability and they mastered the new duties that were thrust upon them, and in that way qualified for their present jobs, irrespective of their University training. To illustrate this point it is only necessary to cite the following: the General Superintendent of the Lake Shore Mines Ltd., graduated in Geology and Minerology; the Chief Geologist at the same mine graduated in Mining Engineering; the Assistant Mine Superintendent at the Lamaque Gold Mines Ltd., graduated in Civil Engineering; the Professor of Mining Engineering at the University of Toronto holds the degree of Civil Engineer; three of the Professors in the Department of Chemical Engineering at the University of Toronto graduated in Mining Engineering; while the General Manager of the McIntyre Porcupine Mines Ltd., never went to any college or University. The answer to the question—what type of work can the graduate in Mining Geology expect to get—depends entirely on the individual's choice and the company with whom he gets a job.

# Flying in the Stratosphere

*Entry in the Student Paper Competition held at the joint meeting of the Engineering Institute of Canada, Toronto Branch, and the Engineering Society of the University of Toronto, on February 24, 1938.*

I believe you will all admit that aviation is going to be intimately associated with our future civilization. Indeed, it is very closely allied with some branches of our present life. There are several lines of study possible under the subject of aviation and it is one of these that I would like to enlarge upon at this time, namely, the possibilities in high altitude flights. What advantage can we take of the 200 mile layer of atmosphere surrounding the earth? Have high altitudes any place in the future of aviation? These questions I will endeavour to answer.

It is common knowledge that the temperature of the atmosphere falls as one moves outward from the earth. This condition continues until a height of 35,000 feet is reached, where the temperature has fallen to —67° F. Above this height no further decline in temperature occurs and actually it rises until, at a height of thirty miles, the atmosphere is believed to be about as warm as on the earth. Thus, the whole atmosphere may be considered to be divided into two zones, the troposphere, where the temperature is falling, and the stratosphere, above 35,000 feet, where the temperature is constant or rising.

The pressure of the air at 35,000 feet is about one-quarter that on the earth. The density of the air is almost correspondingly reduced and this brings the real advantage of high altitude flights. The air is less dense and offers less resistance to motion and to high speed flying.

Winds and clouds are important factors in the airman's life. It is known that winds increase with height until at the top of the troposphere they may be five times as strong as on the ground. Upon passing into the stratosphere, however, it is found that they begin to fail. As we go higher, the winds become fewer and weaker. In the stratosphere, also, the winds are generally of a westerly nature.

In considering clouds, above a height of 20,000 feet we are free from the possibility of continuous clouds and in the stratosphere itself there are no clouds whatever. Also, the bumpy air that is the cause of air sickness, is conspicuous by its absence.

The advantages of stratospheric flying are numerous and obvious. The disadvantages, however, are also numerous and probably just as

obvious. First, let us consider the pilot. He must have a store of oxygen with him to be used after he nears the 20,000 foot mark. Also, he must have an artificial heating system installed in his flying suit or cabin to enable him to withstand the rigorous temperatures encountered.

The engine is somewhat similar to the pilot, in that it requires oxygen for its life. As it goes higher, the density of the air decreases and the less oxygen it can suck in per stroke to combine with the gas. Consequently, the power falls off. This is remedied by the use of the supercharger, which compresses the air to near ground pressure. The supercharger usually consists of a centrifugal fan, rotating faster than engine speed. The fan throws air from its tips at a high speed into a diffuser, which changes its energy from the form of velocity to the form of pressure. However, if the compression is carried far, the heating of the air becomes a serious matter. For this reason a single supercharger is seldom found that will maintain ground pressure conditions at a height of more than 15,000 feet. At higher altitudes it is necessary to use a multi-stage supercharger. While this arrangement is quite practical, yet it must be paid for in loss of power and in increased resistance.

The lubrication and ignition systems of the engine require special attention. Also the fuel must be considered. It must neither freeze at the low temperature nor boil because of the low pressure occuring at these heights.

*Electrical Laboratory*

Once the mechanical features are solved and a stratospheric flight is made possible, how can we utilize its advantages? One thing seems certain; such flights will not be practical except over long distances of at least 1,000 miles as the time of ascent and descent will take such a large proportion of the flying time. Any gain made by increased speed will be lost thereby.

However, a theoretical comparison of a 2,000-mile flight made by the same plane at ground level and at a height of 40,000 feet shows a considerable saving in both time and fuel consumption. Whereas, at ground level the flight would take ten and a half hours to accomplish, at 40,000 feet it would entail a flying time of seven hours and a fuel consumption of just two-thirds that of the first flight.

The report of the record altitude flight made by Squadron Leader Swain of the Royal Air Force in 1936 is an interesting study from the point of view of equipment necessary for such a flight. Using a monoplane of all-British construction, he attained a height of 49,967 feet. He reached this altitude in 45 minutes, flying 100 miles in doing so. In place of a pressure cabin, Swain wore a special high altitude pressure suit, designed along the same lines as a diver's outfit. Individuals have worn this suit in low pressures equivalent to an altitude of 80,000 feet without discomfort. Due to the very high degree of supercharge required, a high mixture temperature was unavoidable and so the fuel used was of high anti-knock value to combat the ill effects caused by this. Also the fuel had a high calorific value to keep down fuel consumption and fuel load.

What future can we see in stratospheric flying? It is believed that such flights will eventually be practical in routine schedules. However, it will come as a gradual change. Pressure cabins will probably be used at lower levels first, and, as public confidence is gained, commercial aviation will raise its "ceiling" until the advantages gained in stratospheric flights are actually being utilized.

MAJOR-GENERAL SIR JAMES H. MacBRIEN, K.C.B., C.M.G., D.S.O., Commissioner of the Royal Canadian Mounted Police, died in Toronto on March 5, 1938. Sir James attended the School Dinner last fall as guest-of-honour and delivered a most enjoyable address. Shortly after this occasion, he underwent an operation for an internal ailment. After a long period of alternate rallies and relapses, he passed away, leaving a host of friends behind him.

Sir James was held in highest esteem by all that came in slightest contact with him. School's memory of Sir James is short, but a very happy one. It is with a real sense of loss that we regard him as departed from us.

*"The Little Red School House"*

# YEAR BOOK

ENGINEERING
SOCIETY

THE UNIVERSITY OF TORONTO

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# ENGINEERING SOCIETY EXECUTIVE

## Faculty of Applied Science and Engineering

## UNIVERSITY OF TORONTO

## 1937 1938

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J.R.A. LESLIE
ENGINEERING PHYSICS CLUB CHAIRMAN

# Impressions of School

*Impressions of School Life during* 1937-38 *as recorded by a representative of each year.*

"Pete" McCurdy, 4T1—

After slumming for an extra week, we were invited finally to call on the Registrar. In the halls, thousands of "Bookies" accosted us who sold tickets for five dollars. 4T1 stood out mystifyingly at the top of these green tickets. What did this mean? The fourth race on track one? After serious contemplation, it was deciphered—come up to the 4th floor on Thursday for our 1st lecture! Such was the first day.

The following day we were bustled up to the top floor of some red building, where we were given some sort of quiz to see if we remembered any of our "Prep" School work or only that Joan's telephone number was HU. 123—. Then we were invited to meet some people called "Softs" and on discovering that we had a slight majority (about 300 to 30) we ploughed through them. Very soon all of us proudly exhibited green ties (in this way we know on whom not to drop flower pots), so those with uninjured heads got to know each other. One fine day, we set out to get a flag. Some of our year came in contact with it; others only with tomatoes.

We celebrated the end of the feud between Soph and Frosh by a super social Suzy-Q at the Royal York, where we encountered 4T0's better half. At this time, the "Big Apple" had just rounded out and several of the professors picked it up as quickly as they did our names.

School At-Home, the greatest of our "shambles", hit us next. The method of taking tickets this year kept a new crop of us from appearing on the dance floor every hour. It was rather unfortunate for our graduating year, who found themselves at the supper dance all evening. All in all, it was an excellent opportunity for us to see the older members of the School at their best.

Our greatest "killer-diller" was School Nite, and it was a killer. Hart House was simply lousy with orchestras; the "Revue" was definitely edible, and so was the food; and lastly (usually not first, but regrettable if not sometime), the warm sitting-out rooms.

The Great Hall took another beating at our School Dinner. The Dinner rounded us out nicely for an excellent speaker. We were enter-

tained by a juggler (who was some sort of an engineer), and a group of male voices at the other end of the Hall (coppers tossed from the gallery adding a tinkling touch to one of their softer songs).

No greater a spectacle can be compared to the "little red school house" during Elections. This year everything ran smoothly (to our bank book's liking), even the potatoes in Hart House gliding with grace and ease. Entertainment at the price of thirty cents a seat topped off our afternoon.

To those of 4T2 who are wondering what this is all about—just bear in mind, that we are expecting you and will definitely give you a bigger and better welcome than we suffered last fall.

* * *

"JEEP" DEWAR, 4T0—

The dominating factors in second year seem to be "lab" reports and fear of examinations, but despite these we had time to view with wonder the changing world and to analyse our own opinions. As usual, where there is a large group of Schoolmen, "women" are the chief topic of conversation. We have all noticed the increasing dearth of beauty on the Campus, and several schemes for remedying this were discussed. It is needless to say that the Schoolmen themselves figured largely in these schemes; one of the plans being to hold a beauty contest during the Dean's lecture, all second year Schoolmen to be the judges.

Every entrant for the contest was to stand up in a bathing suit on the front desk, give her name, address, telephone number and a short speech on "Why Schoolmen Should Take Me Out".

Our views on liquor could be summed up in a very few words, coming over the edge of a well-worn beer mug. Our morals, which in First Year were shaky, have definitely shook, and women we regard with an attached interest.

* * *

"BERNIE" MORIARITY, 3T9—

In the first week of October, we, the Juniors, reported back to the "little red school house" with our pipes in our mouths; (everyone else smokes cigarettes, but aren't we Juniors?). With our pockets empty, after a successful summer of work, we looked around for the gullible Frosh. (We might sell a few subscriptions to the "Varsity", mightn't we?)

After an uneventful first month, the playful antics of the Sophs and Frosh were terminated at the Soph-Frosh Dance. This party, as usual,

turned out to be THE PARTY, at which the senior years were well represented.

Having nothing but three and four labs a week to write, not to mention four lectures a day, we Juniors naturally have a great deal of spare time on our hands, which we spend mostly by wondering if we will ever graduate. We think that, in arranging the curriculum, the Staff figure that they will either kill off the Third year through work, or they will quit through desperation. However, being men, we take it all in our stride, even though we do stagger once in a while—(no cracks).

The Christmas year party was our next social event, at which we definitely proved that rye cannot be taken straight without a hang-over; but anyway the orchestra was good and girls better, so what more could we ask?

The Christmas holidays were too short and anyway, as there were some exams to be written immediately after, the less said about them the better. It must be said, though, that the Faculty must know about us—didn't 60% receive greetings from the office of the Secretary?

The month of January was spent by the Juniors trying to forget the above-mentioned greetings and, as if from Heaven, along came the At-Home and School Nite. Then the final party, combining the first, second and third years, left us one and all hanging on the ropes. The lack of Juniors was mostly due to the fact that we are all scared silly at this late date and, instead of partying, we are making the first panicky efforts at pounding home a little bit of knowledge. It seems the acquiring of knowledge is a prime factor here, even though we all are inclined to disagree.

Soon our ears will be inflicted with the cry, "don't forget, gentlemen, it's the second name on the green ballot"—you guessed it, the elections. These elections seem to finish off School activities and the Third Year man can now settle back and contemplate on the past successful year and look forward to next year when, as a Senior, he will have plenty of time to look for that someone whom he can drink under the table. Surely after three years' intensive practice, and one year of beer-drinking as a Frosh, there must be someone, *n'est-ce pas?*

* * *

"BANJO" LANG, 3T8—

As one of that select group of School men who have almost weathered the storm of the Five Year Plan, by squeezing four years into five (I

hope), I am in a fair position to look back on those years of "fun and games".

Strangely enough, the things that stick out in one's memory are not the General Hydraulic Equation, or the fact that "Every Engineer is by nature an Economist", or that "If 'Y' is a function of 'X', then 'X' is a function of 'Y' ". These invaluable bits of information are there in the recesses of our minds and will pop out if, as, and when it becomes necessary to apply them. No, these facts are in that part of our minds that may be denoted the sub-conscious section, as against the conscious section crammed with such things as—the School At-Home, School Nite, School Dinner, the sports witnessed and participated in, the elections, the tapping parties, the Roxy and all the other numerous smaller events that contribute to make every Schoolman a model of meekness and peacefulness.

Whether or not these things are lost from our conscious memories during the next few months as we push a muck stick or a ruling pen, or as we look through a transit or a test tube, or in later decades as we clip coupons or clip coupons or clip coupons, remains to be seen.

However, there is one thing that we may be absolutely sure of, and that is that these so-called extramural activities are the jam that helps make palatable the bread of Kinetics and Kinematics, Dynamics and Thermodynamics, and the beers that dilute the poisons of inorganic, unorganic and organic chemistry, are the sauce that makes the meal of knowledge almost a banquet.

# Engineering Society Elections—1938

## ENGINEERING SOCIETY EXECUTIVE

*President*.....P. C. ANDERSON
*First Vice-President*.....A. A. MCARTHUR
*Second Vice-President*.....G. P. DEWAR
*Treasurer*.....S. DUNN
*Secretary*.....G. F. KELK

## ATHLETIC ASSOCIATION EXECUTIVE

*President*.....J. F. FORD
*Vice-President*.....F. J. DOBSON
*Secretary-Treasurer*.....K. MACQUARRIE

## CLUB CHAIRMEN

*Debates*.....H. deV. PARTRIDGE
*Architectural*.....E. H. HYMEN
*Civil*.....R. A. RULE
*Chemical*.....H. GREEN
*Electrical*.....W. W. RAPSEY
*Engineering Physics*.....J. L. ORR
*Mechanical*.....L. B. WALKER
*Mining and Metallurgical*.....W. ATKINSON

## 3T8 PERMANENT EXECUTIVE

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*Vice-Presidents*.....G. F. BEARD
E. W. G. GIDDINGS
*Secretary-Treasurer*.....J. L. HEMPHILL
*Councillors*.....E. A. RUSSELL
K. R. BUSBY
E. D. MADGETT
A. C. RIEDER
J. R. A. LESLIE
J. C. LANGFORD
J. C. WILSON
D. W. MCLEAN

## 3T9, FOURTH YEAR EXECUTIVE

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*Vice-President*.....K. W. MALCOMSON
*Secretary-Treasurer*.....C. H. VATCHER
*Athletic Representative*.....S. MURRAY

## 4T0, THIRD YEAR EXECUTIVE

*President*.....F. F. WALSH
*Vice-President*.....L. A. PATTERSON
*Secretary-Treasurer*.....W. F. WOODLEY
*Athletic Representative*.....J. J. PIGGOTT

## 4T1, SECOND YEAR EXECUTIVE

*President*.....H. COONS
*Vice-President*.....R. M. BISHOP
*Secretary-Treasurer*.....R. K. PILE
*Athletic Representative*.....A. L. LAMBE

PROF. C.R. YOUNG
HON VICE-CHAIRMAN

MR. W. STORRIE
HON. CHAIRMAN

E.A. RUSSELL
CHAIRMAN

PROF. W.M. TREADGOLD
HON. VICE-CHAIRMAN

W.H. POWELL
VICE-CHAIRMAN

# CIVIL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1937 1938

W.K. CLAWSON
SEC.-TREAS.

G.G. BIELBY
4TH. YEAR REP.

J.F. FORD
3RD. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

S.J. SIMONS
2ND. YEAR REP.

G.P. TAYLOR
1ST. YEAR REP.

FOURTH YEAR CIVILS—1938

BACK ROW: Prof. T. R. Loudon, E. H. Webb, K. Shamandurov, G. G. Bielby, Prof. W. J. Smither.
FRONT ROW: Prof. C. R. Young, E. A. Russell, Prof. W. M. Treadgold.

# Civil Club

The primary function of the Civil Club is to promote lasting acquaintanceship among the members of all years in Civil Engineering, to the present and future mutual advantage of each. The secondary function, of almost equal importance, is to bring to the members of the Club, men of wide engineering experience in order that the latest developments in this field may be obtained and discussed. As far as possible, both these functions were combined in all the events of the Club.

This year in selecting our Honourary Chairman, with the object in view of linking the Club more closely with the profession, the Executive were more than fortunate in obtaining Mr. William Storrie, a very prominent Consulting Engineer, to act in this capacity. The justification of this new venture has been shown by the interest which Mr. Storrie has taken in the activities of the Club.

To record the activities of the Club in a manner which will arouse even slight interest is a rather difficult task, for we merely review events with which each one of us is already well acquainted. However, as this duty befalls us, we will endeavour to recount all activities and events of the above-mentioned Club.

The year opened with a very successful trip for all members of the Club, to the plants of the Hamilton Bridge Company, and the Steel Company of Canada, in Hamilton, and then proceeding on to Buffalo and ? , to conclude the first event of the year.

The next get-together of the Club took the form of a luncheon meeting in Hart House, with almost 100 per cent. attendance. At this meeting the Freshmen were introduced to Prof. C. R. Young, who gave a very instructive talk on "Engineering Traditions".

At the final meeting of the Fall term, which took the form of a Smoker, Mr. W. Storrie, our Honourary Chairman, presented an exceedingly interesting talk, illustrated with slides, on the new Toronto Waterworks System.

The apex of social events was reached on January 25, with a dance held jointly with the Mining and Metallurgical Club at the Boulevard Club. Space will not permit us to go into the gory details, but let us merely say "When better parties are held, the Civils will hold them".

On February 8th, Hart House once again served as a background for a luncheon meeting. On this occasion Mr. J. A. P. Marshall, of the Department of Highways of Ontario, gave a very interesting illustrated talk on "The Highways of Ontario, both present and future".

With this imposing list of successful events behind them, the Executive have still on their calendar, plans for a joint Smoker with the Mechanical Club, which will be a new departure in their activities, and a final luncheon meeting in March to top off the year's program.

Through the year the enthusiastic support given our functions by the Club members has been a source of real gratification to the Executive. We are also grateful to our Honourary Chairman, Mr. Storrie, and to those members of the Faculty Staff who have so kindly taken an interest in our activities.

The best of good luck and wishes to each of our members for success in the future.

Earl A. Russell,
*Chairman.*

## Mining and Metallurgical Club

It can be truthfully said that the Club enjoyed a successful year and its activities were appreciated by the members. This year the membership was enlarged to include the members from the new department of Mining Geology. We welcome this addition to our membership and trust that the Mining Geologists will support the Club and derive all the benefits it can give them.

After much debate on the matter, we reverted to the old system of procedure for the Fall Smoker and had the Freshmen provide the entertainment. They did so in the time-honoured method and a very hilarious evening was provided.

The success of the Club this year was due in no small way to our capable honorary members, the Hon. Wesley Gordon, and Mr. A. F. Brigham. Mr. Gordon, who was former Dominion Minister of Mines, acted as our Honorary Chairman. He was really interested in the Club and its members and gave the executive invaluable assistance.

He delivered a very interesting, provocative talk at our first dinner held in December. It caused much comment and discussion, both from the staff and the undergraduates. The Engineers' Club was crowded to overflowing for the occasion.

The Club combined with the Civil Club to give the M. & M.-Civil Dance which was held at the Boulevard Club in January. It was one of the most enjoyable held in the last few years.

The next dinner was held at the Military Institute. Mr. C. C. Huston, a consulting engineer, gave a talk illustrated with photographs in which he showed his travels about the world in search of gold.

PROF. G. A. GUESS
FACULTY SPONSOR

PHOTOGRAPH NOT OBTAINABLE

A. F. BRIGHAM
COUNSELLOR

J. L. LANG
CHAIRMAN

THE HON. W. A. GORDON
HONORARY CHAIRMAN

R. SNITCH
VICE-CHAIRMAN

# MINING AND METALLURGICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

## UNIVERSITY OF TORONTO

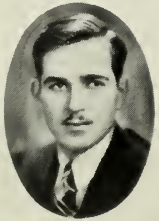
## 1937 1938

W. C. ATKINSON
SEC.-TREAS

J. O. GORMAN
4TH. YEAR MINERS

L. F. TRAIN
3RD. YEAR METALLURGISTS

W. J. H. DISHER
3RD. YEAR MINERS



B. L. DAVIS
1ST. YEAR MINERS

A. D. HUDSON
2ND. YEAR METALLURGISTS

ASHLEY AND CRIPPEN
TORONTO

J. K. MACFARLANE
2ND. YEAR MINERS

L. V. LICHTY
1ST. YEAR METALLURGISTS

FOURTH YEAR MINERS AND METALLURGISTS—1938

FRONT ROW: Prof. J. A. Newcombe, Prof. J. E. Toomer, Prof. G. A. Guess, Miss J. Bradshaw, Sec'y, Prof. H. E. T. Haultain, Prof. J. T. King, Mr. W. A. M. Hewar.

SECOND ROW: E. W. B. Kleinsteiber, W. P. Archer, C. W. Archibald, G. E. L. Peacock, J. R. Hayward, I. L. Jennings, D. B. Ross, A. E. Gallie, D. H. McLaren, G F. Beard, J. Lang, Mr. R. H. Junker.

THIRD ROW: H. W. Sisson, J. R. Clements, N. Hogg, W. A. Harris, D. W. McLean, D. W. Lathrop, R. Snitch, A. J. Perry, C. E. L. Partridge, Mr. T. A. Frankish, H. F. Bengry.

FOURTH ROW: J. E. Lee, H. J. H. Dixon, A. E. Johnstone, J. D. Fox, A. Gamble, J. A. Procunier, T. C. Powell, D. Waddell, J. T. Maw, Mr. W. T. Turrall.

BACK ROW: R. J. New, T. H. Mitchell, J. O. Gorman, C. Brown, J. E. V. Goodwill, W. R. Jackson, L. N. Harlock, C. G. Little, J. W. Crocker, D. E. G. McDonald, F. R. Shaw, G. C. Simms.

ABSENT: Prof. F. C. Dyer, Mr. S. E. Wolfe, K. R. Busby, M. R. Brown.

Mr. A. F. Brigham, a consulting Mining Engineer of world wide reputation was the Club's Counsellor in connection with our affiliation with the American Institute of Mining and Metallurgy as an affiliated student society. He was formerly consulting engineer for Hollinger Gold Mines, and now has a consulting office in Toronto.

The Club, this year, as in other years, was extremely fortunate in having at the dinners, numerous men of the industry and from the practising profession. It is in our contacts with these men that we feel we are fulfilling the purpose for which the Club was founded. The Dinners are strictly informal affairs, which please both the guests from down town and the undergraduates, in that they feel freer to mingle together. This idea is felt to be much more successful than the old system of having all the guests at the head table.

The Club Executive wishes to thank these men for the interest they are showing in our affairs and also thank the staff and students for the hearty support they have given the Club in the past year.

It is our wish that the new executive have as much co-operation during the next session as we have enjoyed during 1937-38.

J. LANG,
*Chairman.*

## The Mechanical Club

With final examinations now drawing near, we realize that once again it is necessary to bring to a close the activities of the Mechanical Club. During the past winter the Club has flourished, and has undoubtedly been a means of providing greater fellowship among the students in Mechanical Engineering.

Although the Mechanical Club was originally constituted as a purely technical organization, its importance as such has been lessened by the work of the Student Branch of the American Society of Mechanical Engineers under the capable leadership of Vernon M. Parrish, since this society has fostered technical advancement for undergraduates in Mechanical Engineering. With this being the case, the Mechanical Club has deviated from the purely technical field and has sought to provide for its members greater opportunity of obtaining new contacts both within the School and without.

The program by which this was accomplished included many varied activities, as follows:

Three Smokers were held in Hart House; the first was addressed by Professor R. W. Angus concerning his trip to Italy and Switzer-

PROF. R. TAYLOR
HON. VICE-CHAIRMAN

I. W. SMITH
CHAIRMAN

MR. C. B. HAMILTON JR.
HONORARY CHAIRMAN

PROF. R. W. ANGUS
HON. VICE-CHAIRMAN

L. B. WALKER
VICE-CHAIRMAN

# MECHANICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

## 1937 1938

F. F. WALSH
SEC.-TREAS.

E. D. MADGETT
4TH YEAR REP.

D. R. TENNENT
3RD. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

L. A. PATTERSON
2ND YEAR REP.

W. R. HOFFMAN
1ST. YEAR REP.

FOURTH YEAR MECHANICALS

FRONT ROW: I. W. Smith, Mr. Wiren, Prof. McIntosh, Prof. Allcutt, Prof. Angus, Prof. Taylor, Mr. Lord, V. M. Parish, G. E. Otter

SECOND ROW: R. F. Mark, I. A. Jackson, L. B. Sheridan, A. G. Clarkson, L. C. Foster, J. K. Ronson, J. L. Hemphill, A. E. King, J. E. Stott, J. A. Carmichael.

BACK ROW: E. D. Madgett, D. M. Jamieson, J. H. Smith, C. A. Ernst, E. G. Turner, B. C. Doupe, A. C. Hewson W. C. G. Fraser, D. A. Henry, W. C. Bleaken, R. D. Margesson, H. L. Minaker

land; the second one by Mr. D. McCrimmon of the C. A. Dunham Co.; and the third one, held in conjunction with the Civil Club, by Mr. Harkness, who is a prominent consulting engineer in the city.

The Annual Dance once again took place in the Royal York Hotel, along with the Electrical and Engineering Physics Clubs, and was considered by those who attended to be a very successful function.

A dinner was held in the Oak Room of the Union Station, followed by a talk on boilers by Mr. R. C. Wiren of the University Staff, and an inspection trip of the Central Heating Plant on York street.

Other inspection trips included: A bus load of Fourth Year students to the Queenston Power Plant and Huntley Steam Station, in Buffalo; a trip by Third Year men to the Westinghouse Co. and the Steel Co. of Canada in Hamilton; and trips by Second and First Year chaps to the Canada Wire and Cable Co. and the Goodyear Tire and Rubber Co., in the vicinity of Toronto.

Plans are now under way for the Annual Dinner, which this year will be held in the Walker House Hotel. Entertainment will be provided by members of the Club, and the address will be given by Mr. W. A. Osborne of Galt.

Since this brings us to the end of the Club's present activities there is little left but to express appreciation for all those who contributed to a successful 1937-1938 session, and to wish those who follow "the best o' luck"!

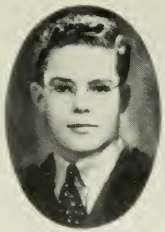
Irvine W. Smith,
*Chairman.*

## The Architectural Club

The Architectural Club has enjoyed a very successful year. In all its activities the executive has had the generous co-operation of the staff and the students.

A large group of graduates turned out to the club dinner, which was held at the Arts and Letter Club last fall. Mr. Dick Fisher, our Honorary Chairman, held our attention with a thoughtful talk on "The Practical Architectural Education". The evening was rounded off with some humorous skits by the various years.

The Mauvais Arts Ball featured some elaborate decorations. The evening was a very enjoyable one and will be remembered by all of us. Our speakers this year included Col. Mackenzie Waters, who gave the highlights of a recent trip to Europe; Mr. Allward, who offered some practical hints on the design of office buildings; and Mr. Guy Mitchell,



B.H.M. TEDMAN
SEC.-TREAS.

E.H. HYMMEN
VICE-CHAIRMAN

W.H. BIRMINGHAM
CHAIRMAN

MR. R.A. FISHER
HON. CHAIRMAN

O.F. BUSH
5TH. YEAR REP.

C.E. PRATT
4TH. YEAR REP.

# ARCHITECTURAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

## 1937 1938

L.A. OXLEY
3RD. YEAR REP.

E.J. FARAH
2ND. YEAR REP.

ASHLEY AND RIPPEN
TORONTO

F.C.T. ROUNTHWAITE
1ST. YEAR REP.

FIFTH YEAR ARCHITECTS

FRONT ROW: K. J. Duckworth, W. E. Barnett, W. A. Ramsay, O. F. Bush, A. H. Taylor, A. H. Armstong, A. C. Rieder.
BACK ROW: W. H. Birmingham, Mr. Carswell, Prof. Arthur, Prof. Burden, Prof. Madill.

who explained the benefits of a better understanding between the architect and the interior decorator.

We were fortunate in obtaining permission to inspect a number of buildings while under construction, and in having their special features explained for our benefit.

Because we were a small compact body, the various years have become better acquainted this year than has been the case in the past. As a result, the meetings and other club activities have been supported in a manner very gratifying to the retiring executive.

W. H. BIRMINGHAM,
*Chairman.*

## Electrical Club

Nearing the close of another academic year, and the close of University life for 3T8, we look back upon a year full of the most enjoyable, entertaining and instructive activities that School and the Club have ever experienced. We have been most fortunate in the arrangement of meetings, which, although not many in number, have been of the highest order in educational quality and interest.

The Annual Dinner was a success in all ways, at which M. R. E. Jones, Chairman of the Toronto branch of the American Institute of Electrical Engineers, gave an address on "Power Distribution". The Dance, where the Electricals, Mechanicals and Engineering Physicists combined for a joint celebration, was generally acclaimed one of the best on the Campus.

The following is a brief account of the year's activities:

Oct. 22, The annual fourth year trip to Niagara and Buffalo to visit the power plants.

Oct. 26, Mr. O. W. Titus, our Honorary Chairman, gave a most interesting talk on Boulder Dam.

Nov. 23, Mr. E. C. Budd related some of his many and varied experiences of travelling in Turkey, while purchasing Oriental rugs.

Dec. 8, Electrical-Mechanical-Engineering Physics Dance.

Jan. 20, A very interesting and well-explained trip through the Hydro sub-station at Leaside.

Mar. 8, The Annual Dinner—Mr. R. E. Jones, on "Power Distribution.

About March 22nd, we hope to hold another smoker, which has not been definitely arranged as yet, but is still hanging fire.

E. L. DODINGTON,
*Chairman.*

S.D. Turner
SEC.-TREAS.

E.L. Dodington
CHAIRMAN

Mr. O.W. Titus
HON. CHAIRMAN

W.C. Moull
VICE-CHAIRMAN

R.J. Gillespie
4TH. YEAR REP.

# ELECTRICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

## 1937 1938

G.A. Cooper
3RD. YEAR REP.

D.E. McGregor
2ND. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

G.F. Kelk
1ST. YEAR REP.

FOURTH YEAR ELECTRICALS

FRONT ROW: Mr. R. J. Brown, Prof. V. G. Smith, E. L. Dodington, Prof. H. W. Price, Prof. A. R. Zimmer, L. S. Lauchland, J. E. Reid.
SECOND ROW: J. R. Dunn, F. R. Quance, J. M. Hales, D. C. King, D. R. Pringle, T. G. Quance, C. L. Brunette, T. J. Nolan, C. J. Bridgland.
THIRD ROW: R. J. Gillespie, G. B. Hunnisett, R. E. Young, J. C. Wilson, E. A. Turner, R. A. Oldham, D. H. Little.
BACK ROW: T. L. Cook, H. E. deLangran, G. T. Hodgson, J. A. Loutit, S. G. Jong, R. G. Weaver, C. H. Salvadge

DR. R. R. McLAUGHLIN
HON. VICE - CHAIRMAN

R. T. WADDINGTON
VICE - CHAIRMAN

E. W. G. GIDDINGS
CHAIRMAN

MR. J. E. T. MUSGRAVE, B.A.Sc.
HONORARY CHAIRMAN

# INDUSTRIAL CHEMICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

## UNIVERSITY OF TORONTO

## 1937 1938

G. KENNEDY
SEC.-TREAS.

W. M. CAMPBELL
4TH. YEAR REP.

H. R. GREEN
3RD. YEAR REP.

M. A. WILSON
2ND. YEAR REP.

R. M. BISHOP
1ST. YEAR REP.

B. SHOCKETT
CURATOR

ASHLEY AND CRIPPEN
TORONTO

# Industrial Chemical Club

The year 1937-38 had its ups and downs. The Executive were fortunate in bringing back to School a graduate of the early 20's, Mr. J. E. T. Musgrave. As Honorary Chairman, this gentleman showed an active interest and delivered a very interesting address on Printing Inks in January.

Several smokers were held in Hart House dealing with the technicalities of chemistry. Mr. Miller of C. I. L., Toronto, spoke on the "Cosmetics of Industry". Dr. R. R. McLaughlin chose as his subject "From the Test Tube to the Ton with Organic Chemicals". In this he pointed out the value of pure research, in so far as the possibilities of its practical application extend, by examples of processes which have sprung up in recent years as a result of discoveries, accidental and otherwise.

In December, an experiment along social lines was attempted. The men of the Industrial Chemical Club treated the girls of the Honour Science Club to a grand stag "catch as catch can" dance, brawl, shindig, or what have you, at Malloney's Art Galleries. This evening provided a lot of fun and a few good connections. And we didn't lose much money.

At the time of writing, preparations are under way for a dinner at Diana Sweets on Bloor street. Good entertainment has been planned. The speaker is to be Ken MacTaggart of the Globe and Mail on "Aviation in Canada". This will be illustrated with motion pictures of a flying survey of air transport in our northern sections.

Before the year ends we may yet have another smoker, with either a representative from the Mathieson Alkali Works or a talking picture on "Sil-o-cel" (the filter aid), sponsored by the Johns-Manville Co.

I would like to extend congratulations to Hugh Green, newly-elected chairman, and wish him good luck and good speakers for the forthcoming year. Get behind the Chem. Club and support your only organization in School where Chemicals can hob-knob and meet one another. You will only be here four years, and they pass too quickly to miss any opportunities of mixing in with your fellow-engineers—at School as in the profession.

E. W. GARNER GIDDINGS,
*Chairman.*

FOURTH YEAR CHEMICALS—1937-38

FRONT ROW: A. S. Weatherburn, B.A.Sc., N. R. Fasken, B.A.Sc., Dr. R. R. McLaughlin, M. Adelman, B.A.Sc., Prof. J. W. Bain, Dr. M. C. Boswell, Prof. E. A. Smith, W. H. Rapson, B.A.Sc.

SECOND ROW: W. F. McLean, B. H. Mackenzie, J. C. Langford, E. A. R. Pilsworth, F. Kubath, E. T. Charnock, G. A. Dick, N. W. Smith, C. K. Gibbs, M. G. O'Leary.

THIRD ROW: D. S. Fensom, R. G. Gray, E. J. Davies, R. W. J. Lewis, L. J. Rubin, E. S. Brough.

FOURTH ROW: R. F. H. Hoskins, C. Bridges, J. W. R. Hodgins, J. M. Hacking, E. L. Horenbala, G. L. Case, E. B. Parsons.

FIFTH ROW: R. J. Stevens, J. M. Gibson, D. M. Jamieson, H. D. McIntosh, H. W. Bradley, H. W. Allan, Dr. J. G. Breckenridge.

SIXTH ROW: E. Turner, W. M. Campbell, A. M. Fraser, J. P. Kirkby, R. P. Bales, J. R. Millar.

BACK ROW: G. P. Beal, M.A.Sc., A. F. Graham, J. M. Detweiler, J. P. Heatley, L. H. Wittenberg, E. W. G. Giddings, B. Marks, B.A.Sc.

J.D.H. BARNES
SEC.-TREAS.

J.R.A. LESLIE
CHAIRMAN

PROF. T.R. LOUDON
HON. CHAIRMAN

J.L. ORR
VICE-CHAIRMAN

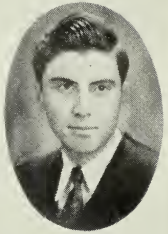
R.D. HISCOCKS
4TH YEAR REP.

# ENGINEERING PHYSICS CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

## UNIVERSITY OF TORONTO

## 1937 1938



J.A. LUNDY
3RD. YEAR REP.

H.G. STARK
2ND. YEAR REP.

V.V. MASON
1ST. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

# Engineering Physics Club

Our Club is now one year old, with one successful year behind it. Our 100 per cent membership this year will be something for this and the other Clubs to strive for. When we decided to form a Club of our own, there was some opposition to the idea. They asked us what were our objectives, would we have enough members, and would those members turn out to the meetings.

Our aim, as in other Clubs, has been to create an interest in this course—an interest in it amongst those people who would be our employers, and an interest amongst those who have entered this new course in Engineering Physics. We have also desired a voice in Engineering Society affairs, and recognition from the rest of the students of our presence in School. Formerly it seemed that only the Professors admitted we were in S.P.S., but with our entrance into the Engineering Society as a Club, we can submit our ideas to the whole student body.

We have endeavoured in our meetings to have topics discussed which were not too technical or specialized, as we thought such matters are found in the curriculum. Rather have we tried to interest the members in principles, hoping they will be able to apply them to suit themselves. Professor Loudon became our first Honorary Chairman, and has been almost a Service Bureau to us, so many complaints has he received about one thing or another in the course.

Our opening dinner in the early Fall, at Hunt's, Bloor and Yonge, was very successful. We were fortunate in having Dr. Speakman of the Ontario Research Foundation as guest. We were also honoured in having Prof. C. R. Young, and Prof. Burton with us to meet the Freshmen. The evening was concluded with a free ride home (?) by said Frosh, who really found it rather difficult pushing that wagon along Bloor St. At our Hart House Smokers, we have been entertained by Mr. Lazier, who introduced to us the subject of Art, and Prof. Loudon, who gave the lower years some much-needed advice on the options in the course. Cider and refreshments were plentiful at these affairs. The trucking was found simple and enjoyable at our Dance in conjunction with the Electrical and Mechanical Clubs before Christmas, when the boys forgot for a few short hours the many problems on their horizon.

The Fourth Year men managed to invite themselves to the annual Electrical-Mechanical trip to Queenstown and Buffalo in the Fall. On January 19th, the Club inspected the many processes involved in the manufacture of wire at the Canada Wire and Cable Plant at Leaside.

FOURTH YEAR ENGINEERING PHYSICISTS—1938

BACK ROW: Prof. E. F. Burton, Prof. V. G. Smith, Prof. C. R. Young, Prof. J. Satterly, Prof. L. Gilchrist, Prof. T. R. Loudon

FRONT ROW: W. H. McPherson, R. D. Hiscocks, J. R. A. Leslie, C. B. Campbell, T. D. Northwood, G. K. More.

A. L. GUESS
VICE-CHAIRMAN

M. J. C. LAZIER
HON. CHAIRMAN

T. L. COOKE
CHAIRMAN

H. DE V. PARTRIDGE
SEC.-TREAS.

D. S. FENSOM
4TH. YEAR REP.

# DEBATING CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1937 1938

F. C. READ
3RD. YEAR REP.

C. W. SHEARER
2ND. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

B. ETKIN
1ST. YEAR REP.

On February 21st, the Freshmen enjoyed a trip through the Steel Company plant in Hamilton.

The Executive and also the graduating year would like to express their appreciation of the continued interest shown in our course by Dr. Benton and his staff, Dean Beatty and the staff in Mathematics and our Engineering Professors.

Now I will let Jack Orr and his assistants take over the controls and may they have as enthusiastic a crew as the retiring executive has had. Good luck boys, and stick to it.

J. LESLIE,
*Chairman.*

## Debates Club

"I declare the meeting adjourned."

The Chairman's gavel fell, and thus the activities of the Debates Club for the season 1937-38 were brought to a close. The past season, notable for the timeliness and interest of the topics debated, has been one of the most successful on record.

In the first debate, Dick Hiscocks, aided by a huge majority of the House (74-6), defeated Garner Giddings' motion that "The present production of Engineers at S. P. S. is detrimental to the profession."

"We should have more debates" was moved at the second debate, and this motion was carried, due to the combined efforts of Jack Newton and Dr. McLaughlin, guest speaker; the two of them snowed under the opposition leader, Cy Reed, who could find only one other vote against the motion.

Trinity College sent two speakers to the next event, and the guests, E. Cranfield and A. H. Crosbie, obtained passage of the motion that "Canada should participate more actively in world affairs", in spite of the opposition of Lionel Train and Bill Shearer of School.

A filibuster from the floor by the self-styled manager of the First Year team, Bernard Etkin, swayed the House to support the government control of radio in Canada at the first Segsworth Trophy debate. However, the judges thought that the arguments of Cy Reed and Allan Wickett of Third Year had the edge on those of Ed Pashler and Norm Bennett of 4T1, so Third Year proceeded to the final.

In the second trophy debate, Second Year, represented by Yorke and Jack Williamson, went down to defeat before the onslaught of Bob Bales and Quentin Jackson of Fourth Year.

The final contest was won by the Third Year team, which supported the construction of the St. Lawrence Seaway. This debate was

one of the best prepared of the season and Fourth Year went down to defeat only by a slight margin. The Impromptu Speaking Contest provided a fitting climax to a most noteworthy season.

The help of our Honorary Chairman, Mr. M. J. C. Lazier, in selecting and "censoring" topics for debate, and his witty comments on the arguments of the speakers at the meetings, have been big factors in the success of our club in the past season, and the Club cannot thank him too heartily.

Best wishes to the Executive of next year. May they have an even better season than the one just past.

T. L. Cooke,
*Chairman.*

## Class of 4T1

To most of the members of 4T1, their Freshman year just ending will have been the fullest and most absorbing year of their lives. Looking back, we think of its riotous beginning—with green ties, torn pants, and the refreshing slosh of cold water. The sturdy Sophs may have ripped the flag from the gibbet, but our Fighting Frosh went right in after it—and we still have it.

We began the social season with the Soph-Frosh, according to the custom of yore. Eddie Stroud, his orchestra, and the Shannon Sisters helped to make it a grand party. Old timers said it was the best ever.

The boys really let themselves go at the Christmas party—and no wonder—exams over and holidays ahead. We filled the Boulevard Club to the doors, since ours is the largest year ever to register at School. For the last year dance of the season, the First, Second and Third Year Executives put their heads together and evolved the Junior-Soph-Frosh with Eddie Stroud in the Royal York Banquet Hall.

About this time, the exams loom rather menacingly, to say the least. But apparently they can be passed, so let's keep the crew intact.

You have elected what promises to be an able executive for next year. Give them all your support, by going to the parties which they will arrange and by joining in to give the Frosh a *real* welcome, one that they won't forget.

G. F. Kelk,
*President.*

## Class of 4T0

Gentlemen:

As we sit here and review the events of the past year, we wonder if all you 4T0 men recall some of the highlights as we do. Do you recall having School opening delayed for a week due to the paralysis epidemic and thus keeping us away one more week from the cocky freshmen? Then came the disastrous day when the Freshmen repeated our victory of the previous year in the Flag Rush—remember?

Next try and recall our evening at the Soph-Frosh Dance. Eddie Stroud did himself Noble that night. (Get it?) Congratulations, Freshmen—we had a swell time. We were surprised to hear that some fellows got home from that party just in time to go to our year party which was the next month. Remember, it was at the Boulevard Club and we Big-Appled it (how we hate that dance) to Eddie Stroud again. Then flashed past the Xmas holidays, exams, School At-Home, (remember that floor show), School Nite and is it possible that we forgot to mention School Dinner away back in November?

And then came time for another year party. Where would we hold it? Whose band would we have? Worry—worry—worry! So we discussed with President Kelk the idea of a joint dance and likewise the same idea with President McArthur. Then came the idea—why not a triple year dance? (Yes, gentlemen, we thought of it first). McArthur and Kelk were approached with the idea and they thought it swell. So it was on—the most expensive, largest and superlative year party ever attempted. At the Royal York it took place and Stroud once again "beat it out".

So in conclusion, we congratulate 4T0 for their selection of an executive for next year—and to President Walsh, we want to say, "We're all behind you, Fred. Let's have lots of fun."

Sincerely,

MURRAY SCOTT,
*President.*

## Class of 3T9

After a fairly good sale of year cards, arrangements were made with the Freshman class so that these were good for admission to the Soph-Frosh. Nearly everyone took the opportunity of attending this outstanding School party.

On November 30th, we held our own party, at the Boulevard Club, with about one hundred and ten couples dancing to James Fry and his

orchestra. Then there followed a brief skirmish with Christmas tests and the Department of Electro-Chemistry. Many of us received minor injuries, but did not let them keep us from the At-Home or School Nite.

The final Dance was the Junior Soph-Frosh where first, second and third years combined to hold a successful affair in the Ballroom of the Royal York Hotel.

Meanwhile, the gang had not been idle in intercollegiate and inter-faculty sports. There were many playing Hockey, Rugby, Basketball, Baseball, and Waterpolo in the intramural groups. Several fellows also represented 3T9 in intercollegiate Rugby, Tennis and Boxing.

Nearly all departments made field trips or visits to places of especial interest to them and good times were had by all. The Clubs held their usual smokers, dances and dinners and third year (as usual) was difficult to drag out to these affairs.

In winding up the year, your Executive wishes to thank everyone for their co-operation in selling year cards and running the functions during the session. The best of luck to all in exams and to the incoming executive of fourth year, who will take over in the Fall.

A. A. McArthur,
*President.*

# Class of 3T8

This is the history of a class which is written at the close of one chapter and the beginning of another; to term it completed would be a gross under-statement; we have just begun. Any group of men who have gone through four years together with such complete co-operation, spirit and enthusiasm, cannot fail to establish an even more enviable record as a graduate class.

Our beginning was a humble one, however. In the Fall of 1934, as green a bunch of Freshmen as ever wore a green tie gazed in awe and not a little fear at the learned and very much superior sophomores. We flaunted our green ties, however, with an air of pride and distinction, in the faces of our fellow freshmen from other faculties. At the annual Fall Bye-elections, we showed our sagacity by electing the leadership of Art Kingsmill, Al Hewson, and Bill Disher, and at the end of the year, we already felt ourselves to be the most hardened of School men.

Our second year found the situation reversed and it was our turn to play the part of the stern sophomore to the incoming Frosh. At the annual Ball push, in the Fall, we won the coveted Soph-Frosh Trophy by dint of gouging, kicking and trampling, and so justified our position

W.H. McPherson
SEC.-TREAS

J.L. Hemphill
VICE-PRESIDENT

J.C. Langford
PRESIDENT

Dean C.H. Mitchell
HONORARY PRESIDENT

N. Hogg
ATHLETIC REP.

O.F. Bush
ARCHITECTURAL REP.

G.G. Bielby
CIVIL REP.

# FOURTH YEAR EXECUTIVE

## Faculty of Applied Science and Engineering

## UNIVERSITY OF TORONTO

## 1937 1938

W.M. Campbell
CHEMICAL REP.

R.J. Gillespie
ELECTRICAL REP.

E.D. Madgett
MECHANICAL REP.

J.O. Gorman
M. & M. REP.

R.D. Hiscocks
ENG. PHYSICS REP.

D.S. Fensom
DEBATES REP.

ASHLEY AND CRIPPEN
TORONTO

of top dogs over the Frosh. The usual year parties were well attended and enjoyed, due in no small part to our chosen executive of Jack Millar, George Richards and Jack Langford.

In the third year, Dunc Ross, G. Ridpath, and Frank Woldridge took over the helm and managed to guide us very successfully through a year when Lab. reports, exams and lectures worried our dreams. The bugaboo of the long-dreaded third year had arrived and we went through a period of worry which was relieved only by work.

In the fourth year, we at last managed to feel that the big half was behind us and proceeded to relax, to some extent at least.

The most responsible positions of the Engineering Society Executive Committee were more than ably filled by men of our year; and the year as a whole turned out in loyal support to the majority of the School functions in spite of the new problems of jobs, theses, etc., which confronted us. In fact, the whole class was well looked upon as a good example of spirit and enthusiasm for the three junior years.

With such a record of co-operation, spirit and enthusiasm, it would be unwise to predict anything but a brilliant success for the class as a unit of the alumni and as a credit to our chosen profession.

J. C. LANGFORD,
*President.*

## Message of the Permanent Executive of 3T8

In the fall of 1934, the "Class of 3T8" became a reality, consisting of 224 green hopefuls. Since the "reception" of the class by the Sophomores, otherwise known as 3T7, there have been many obstacles and the 150 survivors, steadying themselves for the last jump, have chosen their Permanent Executive to keep alive in future years the "Spirit of 3T8". The Permanent Executive, therefore, gives out this message to you of 3T8 and asks that you co-operate in making your class live after graduation.

By work and play during the past four years, you have made many close friends, some closer than others by reason of living together, working in closer contact or playing on the same teams. You have also acquired a common bond with each of the other 149 members of the class, the bond of belonging to the same graduating class, and it is desirable that this bond be strengthened with the years.

Strength requires co-operation and unity of purpose. As your Executive it is our duty and desire to keep you acquainted with the doings

E. A. RUSSELL
COUNCILLOR

E. W. G. GIDDINGS
VICE-PRESIDENT

G. F. BEARD
VICE-PRESIDENT

J. R. MILLAR
PRESIDENT

J. L. HEMPHILL
SEC.-TREAS.

K. R. BUSBY
COUNCILLOR

E. D. MADGETT
COUNCILLOR

# PERMANENT EXECUTIVE OF THE CLASS OF 3T8

## Faculty of Applied Science and Engineering

## UNIVERSITY OF TORONTO

## 1937 1938

A. C. RIEDER
COUNCILLOR

J. R. A. LESLIE
COUNCILLOR

J. C. LANGFORD
COUNCILLOR

J. C. WILSON
COUNCILLOR

D. W. McLEAN
COUNCILLOR

ASHLEY AND CRIPPEN
TORONTO

of your fellow classmates. We can only do this with your co-operation; make sure we have your "Contact Card" correctly filled out; keep us informed of any change in address; send us any news of yourself and your family, and we can in turn keep you posted on the news of your "School pals", both by letter and in the pages of the University of Toronto Monthly.

May the "Spirit of 3T8" grow with the years.

*President*
J. R. Millar,
67 Eastbourne Ave.,
Toronto, Ont.,
HY. 1525

*Secretary-Treasurer*
J. L. Hemphill,
14 Servington Cres.,
Toronto, Ont.
MO. 2938.

## Senior Fall Prom

The Fourth Year opened their season's social activities with one of the most successful parties on record at the Boulevard Club on December 1st. The Club looked mighty swell dressed up in the old "School" colours, with a few Hallowe'en witches and pumpkins thrown in to give it that final touch.

The music supplied by Arch Crosley was exceptionally fine. As a matter of fact, it was so good that it did "something" to the boys' dancing—some call it "The Big Apple." Well, whatever it was, a hang of a lot of fun was had trying, even though you did feel a little self-conscious.

The Club facilities supplied a very pleasant diversion in the form of bowling during the intermission, although a lot of the lads could hardly wait to get back on the floor to do a bit "of aswingin' and aswayin' ".

All in all, it was a grand party and the Fourth Year Executive are certainly to be congratulated.

## Graduation Ball

The Class of 3T8 ended its undergraduate social activities with one of the best parties in its history, on March 18th. The Ball Room of the Royal York was arrayed for the occasion in cabaret style and looked very smart "decked out" in the old "School" colours.

The music supplied by Eddie Stroud was so fine that the boys "persuaded" him to stay an extra hour and the Dance continued till four in the morning.

At midnight luncheon was served, being followed by some light entertainment from some of our local talent of Departments Three and Six.

All in all, it was one swell party, and here's hoping we have many more like this in our Alumni days.

## School At-Home

Exclusively Engineers and woe to the Meds that tried to crash the School At-Home on January 14th. For it was on that night that Schoolmen and their ladies danced and made merry till the wee small hours of the morning.

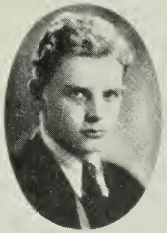
The Royal York was the setting for this gala annual affair. Slide rules and studies were forgotten as sounds of a merry clinking of glass and ice came from filled rooms, and greetings were sung across the halls. It was easy to see that there was going to be no rest that evening.

Sweet rhythms were sounded out by that popular young maestro, Frank Crowley. Throughout the evening, the engineers forgot their usual "dignity" and Big Appled in a carefree way. The Dean's eyes twinkled as he watched the boys, as if he wished to try it himself in some quiet corner.

As to the sumptuous repast served at midnight, accompanied by spontaneous bursts of school songs and yells, little need be said. The entertaining floor show that preceded it was just another of the many things that made the evening a successful one.

School was honoured by the distinguished patronage of Mrs. H. J. Cody, Mrs. C. H. Mitchell, Mrs. C. R. Young, Mrs. R. W. Angus, Mrs. H. H. Madill, Mrs. J. W. Bain, Mrs. A. R. Zimmer, and Mrs. G. A. Guess.

*"All Work and No Play"* *Survey Camp*



J.H. ROGERS
FINANCE

G.F. BEARD
PRESIDENT

J.R. MILLAR
CHAIRMAN

W.F. McLEAN
VICE-CHAIRMAN

A.A. McARTHUR
DELEGATES

# SCHOOL AT-HOME COMMITTEE

## Faculty of Applied Science and Engineering

January 14th. 1938
Royal York Hotel

P.C. ANDERSON
TICKETS

W.E. BARNETT
PUBLICITY

J.D. FOX
ACCOMMODATION

ASHLEY AND CRIPPEN
TORONTO

B.H. MacKENZIE
RECEPTION

K.J. DUCKWORTH
PROGRAMMES AND DECORATION

J.H. ROGERS
FINANCE

D.H. MCLAREN
VICE-CHAIRMAN

J.R. MILLAR
CHAIRMAN

G.F. BEARD
PRESIDENT

W.E. BARNETT
PUBLICITY

A.A. MCARTHUR
TICKET SALES

# SCHOOL DINNER COMMITTEE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1937 1938

K.J. DUCKWORTH
DECORATIONS AND PROGRAMMES

J.L. HEMPHILL
ACCOMMODATION

J.D. FOX
MARSHALLING

ASHLEY AND CRIPPEN
TORONTO

W.A. RAMSAY
ENTERTAINMENT

J.C. LANGFORD
RECEPTION

# 48th Annual School Dinner

Away back last November "Ye Little Red School House" sprouted so many brilliantly colored streamers and posters that one might have thought we were going to celebrate the triumphal return of a conquering hero. And, in truth, that was just about the nature of things, for that well-beloved and ever-popular festive occasion, School Dinner, was about to make its 48th annual appearance.

An army travels on its stomach and so, apparently, do Schoolmen, for after all the advance publicity had gone echoing down the canyons of history (along with the fortunate soul who got the Medical Building for 5 yen in the Auction) a mighty throng of tried and true Engineers assembled in the Great Hall on the memorable night of November 25th to pay homage to His Majesty the Turkey, and to honour our esteemed guest, Sir James H. MacBrien, K.C.B., C.M.G., D.S.O., Commissioner of the Royal Canadian Mounted Police.

Set before us was a feast to tempt the most discriminating palate, followed by an evening of such enjoyment that it will live long in the memories of us all. Pepped up by the Walker Octet and led by a clown, we really went to town on "The Martins and Coys" and all those famous ditties which every Schoolman knows so well. Mr. Frank Sentry then leaped into the arena and gave us a demonstration of Engineering Principles—and could that boy juggle!

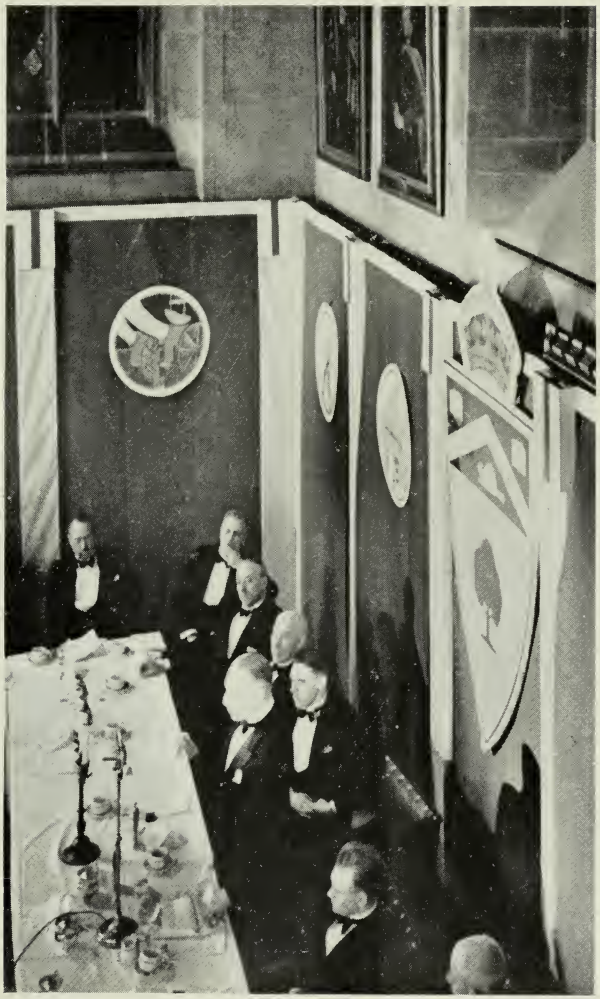
The toast to the University, given by J. C. Langford, was answered by Prof. Beatty, Dean of the Faculty of Arts, who then presented scholarships won by the assiduous (no doubt) labours of the more brilliant of that scintillating company. More presentations as Dean Mitchell gave the Gold Key of the Engineering Society to the graduating officers. Our Chairman, Mr. Beard, then gave the toast to School and the resultant Toike Oike would have warmed the heart of any Old Timer. Once more Dean Mitchell arose to answer this toast and, with his own inimitable wit, mentioned every department in the faculty, summing up with the assertion that the men of School are "the best eight hundred and thirty-two men you can bring from anywhere in Canada", and that in days to come we shall be "always on the spot to do a job the country needs and to help each other". The round of applause that followed his address was a true indication that we look upon him as one of us—a Schoolman—and that we shall endeavour to live up to the faith he has placed in us.

Sir James H. MacBrien then addressed us as speaker of the evening. His opening remark was that he considered it an honour for himself as Commissioner of the Royal Canadian Mounted Police and for Chief Draper of the Toronto Police Force (you see—everybody goes to a School Dinner) to meet the men at the Head Table "unofficially", not, of course, that he would insinuate anything. He gave a most interesting history of the famous Mounties, from the days when they were only one hundred and fifty strong at Fort Garry, up to the present, when they have become one of the most efficient crime-fighting forces in the world, and certainly the most widely known. He told us how they came to adopt their red jackets and the romantic story of how this brilliant coat came to be regarded as the symbol of Law and Order throughout the West and finally throughout the whole of Canada. His story of how the motto "Always Get Your Man" came to be applied to the Men in Scarlet was so good that it didn't take long to spread over the whole campus. However, the real motto, he pointed out, is "Maintain the Right".

He concluded by saying that the force is by no means living on its past reputation, but is forging ahead with science in the latest methods of crime prevention and detection. He followed the address with a series of lantern slides, illustrating life in the North and West as it used to be and as it is to-day.

A blood-stirring Toike Oike concluded one of the most interesting evenings this writer has ever spent and, as we left that Hall and turned our eyes ahead to the 49th, we couldn't help but feel that next year's committee will find it difficult to eclipse the efforts of the men who so ably handled the "Glorious 48th".

*From the "Revue"* *School Nite*



*At the School Dinner*

# School Nite

The "biggest event on the Campus" went over with a bang when School Nite was staged in Hart House. Over nine hundred couples took possession from basement to garret and gave the artistically decorated halls reason to remember the "Toike Oike" through another year.

First on the program was the "Revue". This year, the pleasure-seeking Schoolmen and their friends were treated to a well-chosen program of short snappy numbers presented by an all-school cast. From Bruce Mackenzie and Mike Swick to Prof. Adam Nitwit, the acts were accorded an uproarous reception. The "Chorus" in particular deserve a special bouquet. That bevy of pulchritudinous beauties led by "Twinkle-Toes" Brisco almost stole the show in demonstrating the intricacies of the waltz. The whole performance was created and handled by Maestro Al Ramsay and to him should go the largest bunch of orchids.

Meanwhile, on the dance floor in various parts of the House, the remainder were swinging to the rhythms of five smart orchestras. Someone with an understanding of the engineer included a girl's orchestra among these and thereby earned the approval of all present. Eddie Stroud had charge of the Big Gym and kept it filled all evening with couples dancing to his distinctive music.

What is a dance without refreshments? The committee knew the answer and arranged for a tasty lunch to be served in the Great Hall. Four hungry hordes surged into the hall within two hours, yet the Hart House culinary staff more than met the test and turned them away only when they were satisfied. There were even liquid refreshments provided by the Chem. Club. True, it was only cider, but even cider goes a long way in a dry evening.

The occasion was graced by the patronage of Mrs. H. J. Cody, Mrs. C. H. Mitchell, Mrs. A. R. Zimmer, Mrs. M. C. Boswell, Mrs. W. J. T. Wright, Mrs. T. R. London, and Mrs. H. J. Burden

There are other things that could be mentioned . . . . the Dolphinettes, the Big Apple (both dead and alive), the dimly lit sitting out rooms . . . . the memories bring forth a wish that such "nites" would come oftener. It is with genuine appreciation for the presentation of such a successful evening that we congratulate the School Nite Committee.

W.A. RAMSAY
"THE REVUE"

G.F. BEARD
PRESIDENT

J.R. MILLAR
CHAIRMAN

W.E. BARNETT
VICE-CHAIRMAN

J.H. ROGERS
FINANCE

J.D. FOX
ACCOMMODATION

# SCHOOL NITE COMMITTEE

February 4th., 1938

P.C. ANDERSON
RECEPTION

## Faculty of Applied Science and Engineering

A.A. McARTHUR
TICKET SALES

W.F. McLEAN
MUSIC

ASHLEY AND CRIPPEN
TORONTO

# Student Paper Competitions

In the early years of its life, the Engineering Society held meetings in which technical papers were read by undergraduate members of the Society. In doing this, they fulfilled one of the purposes of their organization. In more recent years, however, in an endeavour to bring a greater reputation and wider interest to the meetings, outside speakers, many of national and international renown, have been invited to address the meetings of the Society. By this move, the student speaker was neglected and has not been heard of for some time.

The Executive Committee of the Engineering Society, this year, considered the merits of this former practice and recommended that an attempt be made to revive undergraduate papers to some measure of their former popularity. In accordance with this resolution, two opportunities were given student speakers during the year to drag their pet subject out of the closet and parade it before the members of the Society.

The first competition was announced as an "essay contest" and perhaps unfortunately recalled all too vivid memories of "essays" in English and Economics. The Society was divided into a Junior and a Senior group and three cash prizes were offered in each division. However, in spite of these inducements, only three Juniors and one Senior found them worth the trouble involved. At a well-attended meeting of the Society on December 10, these papers were read by their authors and were enjoyed by all present. In the Junior division, the first prize was taken by Bernard Etkin, of First Year Engineering Physics, with an interesting essay, "The Engineer in Society". Second and third prizes went Rowed Grieg, Second Year Mechanical, and Arthur Guess, Second Year Metallurgy, respectively. In the Senior division, Mort Brown, of Fourth Year Mining, was the lucky man to take the first prize money without a contest.

On February 24, the Engineering Society met with the Toronto branch of the Engineering Institute of Canada at Hart House. Jointly, they sponsored a competition for technical papers to be read by undergraduates at this meeting. The Engineering Institute generously donated two cash prizes for the competition. There were six entries made, five of them this time coming from the Fourth Year. All the papers were well written and well read. Irvine W. Smith, chairman of the Mechanical Club, took the first prize with a brilliant discussion

of the subject "Arc Welding on Cast Iron". Laird Hemphill, also of the Fourth Year Mechanical class, split the second prize with Bernard Etkin, who gave a slightly revised edition of his prize-winning paper of the first competition. The judges spoke highly of all of the papers and suggested that it would be of advantage to both the undergraduate and the graduate society if this meeting were made an annual one.

This year's executive has made a start in this move towards making the engineer a better speaker and it is to be hoped that next year's executive will deem their policy worthy of pursuit.

## Toike Oike

The writing of this article marks "finis" to another volume of Toike Oike. The staff has endeavoured to put out a paper worth reading and in keeping with the standard of previous years. The fact that every issue was anxiously looked forward to was sufficient evidence for us to assume that we have filled that aim.

Throughout the year, eight editions have rolled off the press, each marking an event of great importance. Briefly, they were: Freshman, Initiation, School Dinner, Christmas, At-Home, School Nite, Election and Graduation editions. The first two are intended to give some fatherly advice regarding the health and happiness of the "Frosh", the others announcing the various events named. The School Nite edition this year was something different in that it consisted entirely of "stories". The fact that it was successful can be gathered from the necessity to print one hundred extra copies the next day and also that it "went on the air" over one of the local radio stations later in the week.

To all those who have contributed to its success, we would like to say many thanks. The kindness of Dean Mitchell in submitting his messages to the students was greatly appreciated, as were the efforts of Jack Orr and Keith Busby in writing their columns "The Alley Cat" and "Sportoike".

The best wishes for continued success go out to the new editorial staff. May they continue to make it the spice of a Schoolman's life.

Jack M. Hales,
*Editor.*

G.A. DICK
4TH YEAR REP.

W.E. BARNETT
DIRECTOR OF PUBLICATIONS
AND PUBLICITY

J.M. HALES
EDITOR

R.A. OLDHAM
ASSISTANT EDITOR

# TOIKE OIKE
# STAFF

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

## 1937 1938

J.L. ORR
3RD. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

W.E.W. STEEVES
1ST. YEAR REP.

# Survey Camp — Gull Lake

August 15th — a date towards which we had looked for many months, at which time jobs were put aside till next summer and fifty some odd Miners and Civils hied towards Survey Camp. Disreputable old cars bearing even more disreputable-looking young engineers clattered along the roads, stopping here and there at strategic points for various reasons such as gas, second-hand oil, information from farmer's daughters, etc. Finally, we landed there, all eager eyes to see if Survey Camp was to live up to the advance stories which had reached our ears. Our answer to this question is the same as it has been for eighteen consecutive years—Yes, the camp more than fulfilled our expectations! I think perhaps those five weeks will live longer in many memories than any other part of our time spent at "School".

After renewing acquaintances with friends who had dwelt apart for the previous three and a half months, and picking out a lower bunk, (if there were any left) or else an upper one that looked fairly substantial, we set about to see what was what.

Much to our surprise, we found that we were expected to work until 4.30 each day. So, being an easy bunch of fellows to get along with, we peeled off most of our clothes and started. The work included surveying, geology, drafting, calculating, and finding excuses for avoiding all of these. The Civils ran boundary lines, improved a highway (tho' it still appears to be in the same or even worse condition), and determined the correct (?) time from the sun. The Miners corrected the Civil's boundary line, because they had learned where we were supposed to end up, sank a shaft, and walked around with a preoccupied, or was it just a tired, look in their eyes, pretending to be looking for rocks which were almost always absent.

We had beautiful weather for observations in the evenings and everyone took advantage of same. One dance was held in the bunk house, and everyone had a lovely time amid the quiet and peaceful atmosphere of dimly-lighted and cedar-draped "chesterfields". We had favours for all sent up from Lindsay and because of these, mixed with Mrs. Minto's fast-disappearing sandwiches, everyone went home "well-filled". It was never made quite clear to us as to why we were not allowed to have another dance—we can only wonder.

However, many an enjoyable evening was spent by having a few free pretzels and peanuts in the Minden House (which by reason of these

free gifts and Terry's personality, got nearly all our business); then, or later, everyone would pile in or on Disher's or Burgess' car and be away to Carnarvon or Hall's Lake. Here we are told that the natives witnessed performances of the square dance that were both devastating and unbelieveable.

Every evening "thousands of dollars" changed hands over the bunk house tables and often it was rumoured that certain fellows would not be back at School if their luck didn't soon change.

Perhaps our most worthy contribution to the welfare of the camp was due to the untiring efforts of that remarkable man, "Doc" Gallie. Well can we see him yet—standing in the bunk house door, his hand beating upon his chest and calling: "Give me ten men, who are stout-hearted men and we'll down and level up the boat-house". Seriously, though, he made a good job of it; many of us too, helped ourselves to Doc's camp kit on those later cold nights when we were broke and had to resort to drinking hot coffee.

There are many things we shall enjoy remembering. Some of them are: "Okle-dokle" Dewart's date with "Peg-Leg"; Bob Wilson sleeping in the rafters; the ruckus in the bunk house the night every bed was turned over and Sanson and "Desperate" Ford kept us all awake; "Chum" Wilson; "Log Tables" Peacock; Burgess' car getting a "nat-cherel" with fence posts; "who is the man who approaches with smiles, and calmly announces, 'I'm Douglas D. Stiles'"; Mr. Schnell; the lynching party; Mr. Gibling taking the camp picture; "Lipstick" Lang telling the cop that he's moulding in Minden; "Cream Porter" Brown; Howie Sisson's interest in the Minden House.

*Gull Lake* *Survey Camp*

# S.P.S. Athletic Association

In the past years, "School" has been noted for its high calibred and spirited teams and this year has not been the exception to the rule. Not only has "School" fielded outstanding teams of her own this year; she has also supplied a large number of players to the University teams.

The new Intramural Sports Committee is now functioning smoothly and "School" is in the thick of the fight for the coveted T. A. Reed Trophy, symbolic of Intramural Sports supremacy.

In capturing and retaining championships, Schoolmen have had their share of success. School has captured, to date, Outdoor Track, Boxing, Wrestling and Fencing, Swimming, Gymnastics and Lacrosse and are still in the running for a few of the other championships.

Our best wishes for the incoming executive in regaining a few more championships.

J. D. Fox,
*President, Athletic Association.*

*Survey Camp*

K. MacQUARRIE
VICE-PRESIDENT

G. F. BEARD
PRESIDENT ENGINEERING SOCIETY

J. D. Fox
PRESIDENT

R. H. GALWAY
SEC.-TREAS.

N. HOGG
4TH. YEAR REP.

# ATHLETIC ASSOCIATION EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

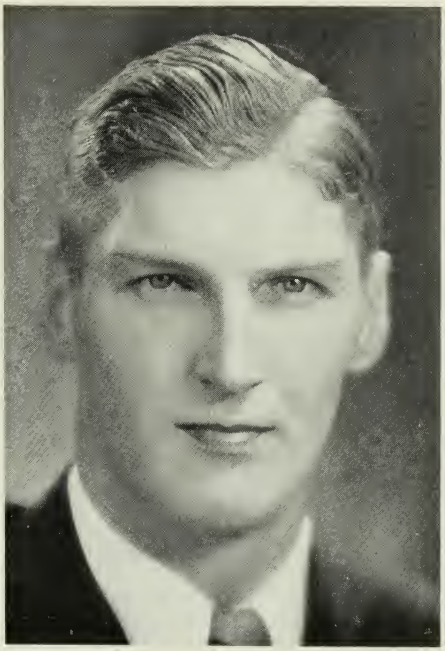
## 1937 1938

H. M. ROBINSON
3RD. YEAR REP.

W. SCHWENGER
2ND. YEAR REP.

A. LAMBE
1ST. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO



## The Bronze "S"

This year the graduating class awarded the highest athletic honour that is within its power to Nels Hogg, and few disputed the decision of the majority. Nels has been one of the really outstanding athletes in the whole of Varsity, not only because of his versatility, but also for his sportsmanship and team play.

The "Star" has probably been best known for his achievements on the basketball floor. Starting with the Junior Varsity team as a freshman, he has risen through the Intermediate ranks in second year to the Senior team for the last two years. This year he was one of the leading scorers of the Varsity squad, playing centre on the first string team.

However, that is only part of the story. Between taking in the odd lecture in class and riding the T. T. C. to and from East York, Nels found time to play rugby, lacrosse, baseball and water polo for School in the interfaculty groups. On these teams, he could be counted on to do his part as efficiently and thoroughly as any man on the team in both practices and games. The standing he holds with his team mates is probably even higher than with the spectators.

Still that is not the whole story. He vehemently denies it, but facts show that Nels is one of those living proofs that athletics and studies will mix. An honour man, he is just as much a leader in class affairs as in sports.

The graduating class is proud of Nels' record and sincerely wish him every success in the future. Judging by his life at School, they will be many.

## The Phene Memorial Trophy

The Phene Memorial Trophy cup was, for the first time, awarded this year. The Trophy, a donation of the Athletic Society, is awarded to the man on the Senior Football Team who displays those characteristics by which the late George Phene lived and played. The choice of Nels Hogg made by his team mates, could not have been better. There is no one who displays the qualities of true sportsmanship, enthusiasm, and team-play to better advantage on the gridiron or in the Classroom.

Good luck, Nels!—and may the trophy be a reminder of the high esteem in which we hold you.

## S.P.S. First "T" Holders

As in past years, School has contributed generously to the intercollegiate teams representing the University. Their activities have been varied and, in all cases, worthy of a first colour holder.

Norm Beattie, Jim McDonald, Bill Schwenger, Ken MacQuarrie, Doug Turner and Howie Sisson have all earned their first colours on the gridiron. Dave Chrichton and Gord McHenry on the track and harrier teams; Nels Hogg in basketball, and Ian Jennings, George Otter and J. M. Girvan on the swimming team are also "T" holders in their respective fields. B. W. & F. competition proved to be the occasions for more Schoolmen to win intercollegiate championships. Jock Piggott and Orv Bush in boxing, Bill Schwenger and Whitey Lathrop in wrestling, and Al Garcia in fencing all were tops in their own class and earned their "T" thereby. Lester and Toye in gymnastics, Shamandurov in soccer, Smith, Carmichael and Johnson in rowing and Bill Piggott in tennis are the remaining Schoolmen to hold the first colour of the University.

"T" HOLDERS

FRONT ROW: J. Girvan, F. Dobson, D. Johnson, A. Carmichael, O. Bush.
BACK ROW: A. Garcia, K. MacQuarrie, E. MacDonald, D. Turner, J. Smith, N. Hogg.

"S" HOLDERS

FRONT ROW: W. Pringle, D. Johnson, J. Girvan, W. Laari, R. Rule, A. King, A. Carmichael, L. Johnson, N. Hogg.
SECOND ROW: J. Smith, M. Robinson, J. Ford, E. Russell, Barnes, S. Murray, B. Moriarty, B. Ballagh, W. Atkinson.
THIRD ROW: H. Powell, R. Galway, W. Archer, W. Burgess, G. Piper, J. Fisher, J. Detweiler, J. Fox.
FOURTH ROW: L. Wood, L. Chambers, C. Archibald, J. Gorman, G. Peacock, W. Fraser, O. Bush, W. Rapsey, W. McPherson
BACK ROW: K. MacQuarrie, E. MacDonald, F. Dobson, J. Leslie, A. Hood.

S.P.S. OUTDOOR TRACK TEAM

THIRD ROW: G. Piper, A. Lambe, I. Thompson, E. Despard, D. Hutton.
SECOND ROW: T. Kingsbury, H. Coons, J. Ames, L. Rodzik. FIRST ROW: G. McHenry.
ABSENT: D. Crichton.

# School Outdoor Track

*Interfaculty Champions*—1937-38

For the first time in three years, S.P.S. came through strongly to to win a decisive victory in the interfaculty outdoor track meet and once more acquire the Rowell Memorial Cup. It was a team that depended for the main part on two strong runners, but also one which needed and did receive the support of the entire team.

In the sprints, Gord McHenry displayed great form to place first in the 100-yard, 440-yard sprints and second to Larry O'Connor, intercollegiate record holder, in the 220-yard run. In the distance events, Dave Crichton came through with three firsts, the half mile, mile, and three mile. His performance in the mile set a new interfaculty record, one of the few broken at the meet.

It remained for the relay team to take the winning points when they warded off a last effort on the part of Victoria, our nearest competitors. Much credit also must be given to the supporting members of the team, who, by placing in the events paced by these two stars, kept S.P.S. in the running.

In the intercollegiate meet a week later, McHenry and Crichton were important factors in Varsity's victory over McGill. Gord came through with two firsts and a second and Dave with two firsts and a third, one of his firsts being a new intercollegiate mile record.

The outlook for the next few years for S.P.S. seems bright and we can look forward confidently to a prominent spot in the track sun.

# School Fencing Team

For another year, Schoolmen dominated Varsity Fencing with Bob Wilson and Al Garcia occupying two of the three berths on the Senior Intercollegiate team and Garcia again capturing the individual intercollegiate championship. In the Senior interfaculty assault, Garcia won the sabre competition and Wilson the epee, while both placed in the foil tournament, ranking second and third respectively.

School is losing one of its steadiest fencers this year through the graduation of Dave Fensom. Dave captained this year's successful Intermediate intercollegiate team and was runner-up in the sabre competition.

Les Greenop and Murray Stewart were also valuable point getters for School.

BOXING AND WRESTLING TEAM

SEATED: W. P. Archer, J. D. H. Barnes, D. H. McLaren, D. W. Lathrop; J. A. N. Carmichael.
STANDING: A. D. Hood, A. H. C. Kingsmill, J. N. Mustard.
ABSENT: J. J. Pigott, W. C. Schwenger, A. B. Scott, W. D. Ramore, G. S. Wilson, G. K. Dymond.

# School Boxing and Wrestling Team

*Interfaculty Champions*—1937-38.

For the second consecutive year, School has succeeded in pounding and squirming its way to victory in both the Junior and Senior assaults.

In the Junior, although not winning by quite as wide a margin as last year, still there were enough enthusiastic engineers on hand to overcome the ambitions of the fighting ministers from Wycliffe, who placed second. The Junior champions in the boxing from School were Carmichael at 118 lbs., and Ramore, at 145 lbs. Barnes, the real boxing "find" of last year and a good aggressive fighter at all times, was unfortunately forced to concede the decision at 135 lbs. when he suffered a cut over the eye. This was indeed a misfortune for School, for Barnes was a consistent point winner in his first year. Hood of School put up a scrappy battle against Dillon of Wycliffe, but the latter proved to be just a shade the better. In wrestling, Mustard at 125 lbs., Grasley at 155 lbs., and Ford at 165 lbs., carried off the honours for School.

When the Intercollegiate teams were chosen, S. P. S. was well represented in both branches of the mitt and mat sport. The successful engineers were: Hood, 125 lbs.; Barnes, 135 lbs.; and Pigott, 165 lbs., in the boxing; and Schwenger, 165 lbs.; Scott, 175 lbs.; and Lathrop in the heavyweight division for wrestling.

In February, the Senior assault was contested and School rose nobly to the occasion to defend the Davidson Cup, won last year in a manner which left no doubt as to the proper trophy cabinet for that emblem of supremacy in the manly art of self defense.

The Interfaculty champions wearing the Blue and Gold in the boxing were: Carmichael, 118 lbs.; Hood, 125 lbs.; Barnes, 135 lbs.; Ramore, 145 lbs.; and Pigott, 165 lbs. Don't run away with the idea that some of these champions did not earn their decisions. The battle between Ramore and De Wolf at 145 lbs. was a gory, bruising slugfest, with quarter neither asked nor given. From a spectator's standpoint, it was probably the highlight of the assault. Another great fight was put up by Usatis, fighting for School at 155 lbs. Bill entered at the last moment and consequently was not at the peak of condition. Had he decided to enter earlier, however, School might have had another name to add to the list above.

In the wrestling, Mustard, 118 lbs., Archer, 155 lbs., Schwenger, 165 lbs., Scott, 175 lbs., and Lathrop, heavyweight, were the championship winners.

Of all the fighters representing School, two, it seems, should receive special notice. These are Jock Pigott and Whitey Lathrop, the former boxing at 165 lbs. and the latter wrestling heavyweight. In their respective sports they are the most polished and efficient performers to be found in the University. Outside the ring they are two Schoolmen out of over eight hundred, but when they climb into the square circle, they are lords of that twenty-foot kingdom where speed and co-ordination of mind and muscle are the requisites for survival. School may well be proud of these two fighting champions.

Here's hoping that next year may be as successful for School as this one has been and that once again the Davidson Cup may be kept where every engineer will tell you it rightfully belongs.

## S.P.S. Gymnastics

*Interfaculty Champions*—1937-38

School, for the second year in succession, has lived up to expectations in winning the Wilson Trophy, symbolic of the Interfaculty Gymnastic Championship. With a team made up of W. Lester, L. Patterson, H. Powell, F. Dobson and J. Ames, four of whom were on the Intercollegiate team, School was hard to beat and came through by a wide margin.

This year, our team was somewhat enlarged, two new men, Ames and Dobson securing places. Both these men made fine showings in the Junior meet, and next year with a little luck, should be near the top of the lists.

The individual honours this year go to Bill Lester, who, although he did not do very well in the Interfaculty meet, won the individual honours in the Intercollegiate meet. Bill also placed third in the Ontario Championships.

Willie Mark, the "grape nuts boy" of the team, performed outstandingly at the Ontario Championships to wing individual honours on the rings. Willie is to be credited for this as the rings were only installed in the gym this year.

School at the present time has quite a strong team, but this will not last. New men are needed. Freshmen especially are urged to turn out, to help fill in and retain the cup another year.


GYM TEAM

LEFT TO RIGHT: J. Ames, F. Dobson, W. Mark, L. Patterson, H. Powell (Mgr.).
ABSENT: W. Lester.

# S.P.S. Swimming Team

*Interfaculty Champions*—1938

This year has been the most successful enjoyed by the School swimmers in many seasons, and their efforts have been rewarded by the return of the Fitzgerald Trophy to S.P.S. Both the Junior and Senior Interfaculty Championships were captured, and also School contributed generously to the University's Senior and Intermediate Intercollegiate Championship teams.

In the Junior Interfaculty meet held in November, S.P.S. amassed a total of 26 points to lead the field. D. Jennings, Girvan, and Walsh won the medley relay, and other firsts were registered by Dobson in the diving, D. Jennings in the backstroke, and Girvan in the breast-stroke. Veal got a third in the 50-yard free style, and the School relay squad, Veal, Laari, Walsh, and McLean, took third place in the 200-yard relay.

The Senior meet in February was one of the best ever staged in the Hart House pool, with School coming from behind to nose out the U.C. team by 6 points, with a total of 28. The medley relay team, I. Jennings, Girvan, and Laari, came second, and another second was registered by Dobson in the diving. School's backstrokers stole the show in their race with I. Jennings winning and D. Jennings third. Otter took third in the 100-yard free style. The stand-out performance of the evening was Girvan's win in the breast-stroke, which set a new record by nearly 6 seconds. To clinch the meet for School, the 200-yard relay team, Laari, I. Jennings, Veal and Otter came in first.

Four Schoolmen swam on the Varsity Senior Team and counted for nearly half the total points in the Intercollegiate meet. I. Jennings and Girvan were on the winning medley squad. Dobson won the diving, and Girvan won the breast-stroke, here also in record form, to break the old Intercollegiate mark by nearly 4 seconds. I. Jennings and Otter got seconds in the back-stroke and 50 free respectively, Otter also swimming on the winning 200-yard relay.

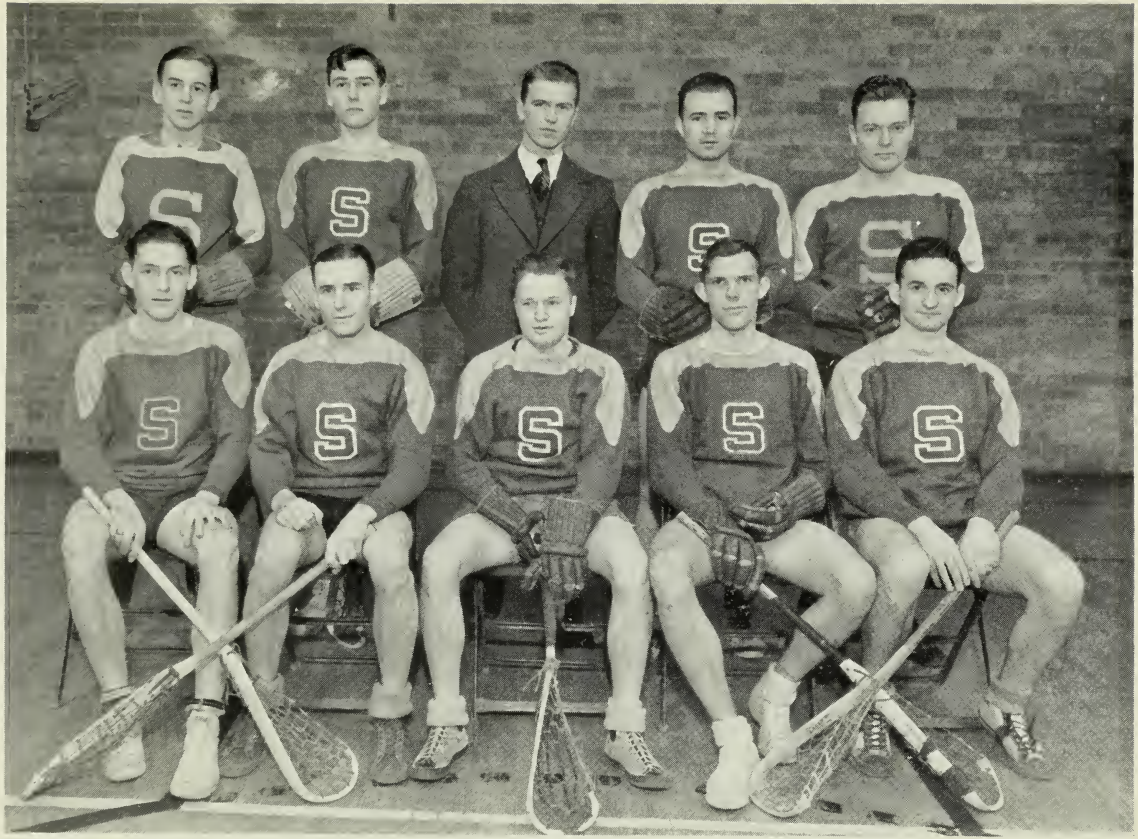
In the Intermediate Intercollegiate meet, School were represented by Harkness, and D. Jennings. The latter was on the winning medley, which set a new record and won the back-stroke.

S. P. S. SWIMMING TEAM

Left to Right:
BACK ROW: W. Veal, W. Laari, D. Jennings.
FRONT ROW: J. Girvan, I. Jennings, G. Otter, F. Dobson.

S.P.S. SENIOR LACROSSE TEAM

M. Robinson, S. Murray, B. Ballagh, R. Rule, C. Archibald, W. Atkinson, N. Hogg., A. Graham, J. Gorman, E. Russell.



S.P.S. JUNIOR LACROSSE TEAM

SECOND ROW: L. Wood, B. Smith, W. C. Atkinson (Manager, K. MacQuarrie, J. Murray.
FIRST ROW: E. Beggs, F. Brown, G. Kirby, S. Jones, A. Douglass.

# Senior School Lacrosse

Interfaculty Champions — 1937

Once again the Dafoe Cup rests for another year at "School", landed there for the third time since 1935 by the same gang of fellows.

The team experienced little difficulty in winning the group, made up of University College, Pharmacy and Senior School. Then a round robin series was played off with winners of the other two groups: Junior School and Victoria. Owing to the fact that the manager was out of the game, due to illness, Senior School won easily, completing the season without a defeat.

Ballagh and Murray are without doubt the best two lacrosse players in the league. Bill Atkinson on defence starred in every game as did Earl Russell in goal. These four along with our so-called coach and manager, Russ Rule, made up the first or "scoring line".

The other, known as the "fighting line", was composed of Archibald, Gorman, Hogg, Robinson, and Graham.

Every fellow on the team could go both ways breaking into the scoring column in some game at least. Hogg, Gorman and Archibald all were much improved over last year, as were Robinson and Graham.

If this gang, that won the first lacrosse championship back in 1934-35 can hang together until next year, you can safely bet on School keeping the Dafoe Cup.

# Junior School Lacrosse

The Junior School Lacrosse Team was again in the fore this year and gave their Senior brothers quite a fight before losing out in the final series.

Practices started as soon as possible with Woods, Douglas, Brown, Kirby, and Murray from the 1936-37 Dafoe Cup team out. Newcomers to the team were McQuarrie, Beggs, Simm, Smith and Jones. The boys practised faithfully and were able to field a fast, well conditioned team with lots of fight. All the players gave a good account of themselves and played really fine lacrosse.

This year Junior School was grouped with Victoria and Meds, both old rivals. During the regular schedule, the team only lost one game to Victoria by a very close margin. This necessitated a sudden death

game to decide the group championship. The Juniors covered themselves with glory in emerging from this struggle with a win in overtime.

Playoffs found Junior School, Senior School and Dents, winners of their respective groups, in a round robin series for the championship. The Juniors found Dents an easy mark, but Senior School got a lead on them in the first game.. Due to the absence of Woods, Brown and McQuarrie in the final game, they were unable to overcome this lead. However, it was not for the lack of trying.

## School Soccer

Due to lack of time for practice, the soccer team was placed at a serious disadvantage which showed particularly in the opening game with Victoria. Team play on the forward line failed to net one goal, while opponents drove in three. In the second game, a hard fighting team held a decided edge in the play over U. C., but weak shooting left the score deadlocked in a 1 - 1 tie. Harakas was the marksman.

The return game with Victoria saw the Schoolmen, playing two men short, hold their opponents scoreless for three-quarters of the game, but finally falter on two plays which resulted in scores for Vic. The less said about the final game with U. C. the better. School tried hard but could do nothing right, while a fighting U. C. team clicked to win 4 - 0.

As far as scores indicate, the season was a failure, but the traditional fighting spirit of S.P.S. was not missing in the soccer team. Playing against two of the best interfaculty teams on the campus, the players gave all they had and need not be ashamed of their efforts.

A ruling of the Athletic Directorate of the University has this year placed soccer as a first division sport. This means that intercollegiate players can no longer compete in interfaculty soccer. Thus when the next season rolls around, S.P.S. must look to its junior years for its soccer team, and if they respond, the Arts Faculty Cup will return to our trophy case.

Congratulations are extended to members of both intercollegiate teams who receive first colours for their playing this year. On the seniors, we have Bill Fraser and Connie Shamandurov, and on the intermediates, Orville Bush, who, incidentally, scored nine of his team's thirteen goals, and Bing Thompson. Also, we sincerely thank our honorary coach, Professor Allcutt, for the interest with which he always follows the team in spite of his many duties.


SOCCER TEAM

FRONT ROW: J. T. Thompson, P. Harakas, W. Fraser, R. Stevens, W. Kinnear.
BACK ROW: Prof. E. A. Allcutt, E. Wilson, G. Powell, J. Edmunds.

SENIOR BASEBALL

BACK ROW: G. Gerry, G. Wheaton, G. Peacock, F. Quance, B. Moriarity.
FRONT ROW: M. Howe, K. Busby, M. Robinson, J. Gibson, R. Galway.

## Senior School Baseball

With only three players back from last year's Senior squad, the graduates from the Junior team were required to fill the gaps. Practices were enthusiastically started before Christmas and soon every position was fought over so keenly that Manager George Peacock even considered drawing names out of a hat to pick the team.

When the schedule finally did get under way, School tuned up their batting eyes on Sr. U. C., winning 15-2. Then our pitchers had an off-day, as Sr. Meds took us to the cleaners with a 15-1 score. Sr. Vic were decisively trimmed twice by scores of 17-6 and 5-3. Then Sr. U. C. were again overwhelmed 10-2. Thus, at the time of writing, School needs only to win their last game against Meds to tie for the group championship. The players feel that the last Meds game was no true criterion of their ability and so they have high hopes of turning the tables on their more-favoured rivals.

The team was a strong one right down the line-up. There were no individual stars that might be singled out, but there certainly was no weak spot on the team. Robinson and Galway shared the pitching duties, while Wheaton and Busby did the same on the catching end. Moriarity, Gibson, Howe, Gerry and Peacock held down the infield, with Quance and Hogg in the "outer gardens".

Whatever the final outcome of the schedule, the team is satisfied that it worked in harmony and gave its best at all times. If the Spalding Cup does not come to School this year, next year's team with much the same combination should be able to make an even more powerful bid for the honours.

## Junior School Baseball

The Junior School Baseball Team appears at the time of writing, to be headed for the group title at least, this year.

They have suffered only one defeat, that at the hands of Junior Meds, when the docs took advantage of what might be called "queer" umpiring to blast the lads to the tune of 16-6. However, revenge is sweet, and the boys got their own back in a no-hit, no-run game against Meds, when they won 2-0.

The team defeated Junior Vic in both starts 16-2, and 9-1, and Junior U. C. 6-2. With only one game to play against Junior U. C., the final outcome of the group championship is assured, we hope.

All members of the team have played good ball at all times, both actually and figuratively. They have shown a willingness to play as a team and to sink personal feeling—a factor which is as important as inherent ability.

The offerings of Diak, as pitcher, were ably backed up by Milne, catcher, Brown and Howard at first base, McArthur at second base, Scott and Coons at third, Kennedy at short stop, McGill, Fisher, Reynolds and Barry in the field. Jim Anderson was the "Master Mind" on the bench.

## School Intermediate Baseball

The Intermediate baseball team has met with much success this year, due chiefly to the brilliant pitching of Orval Bush and the never-say-die spirit of the team.

In their first encounter, they came up against St. Mikes B team. When the last half of the fourth inning rolled aound, they were behind with the score 5 to 2 against them. However, they started in hitting and manufactured four runs to give them their first win, 6-5.

In the second game, they came up against Dents II. team. Here they did much better and came through the winners 9-3, being ahead all the way. The third game brought them up against School's vaunted rival for the T. A. Reed trophy, none other than Wycliffe. Of course, School were set to eliminate Wycliffe and so save several thousand points. Coming in to the last inning, they were trailing 5-3 and here again they showed that spirit to win by amassing three runs while at bat. Orv Bush completed the task of retiring Wycliffe's three batters and so the team won its third straight victory, 6-5.

In the fourth game, by some freak of the schedule, School again met Wycliffe. As all who saw the game will vouch, it was one of the closest of the year. Wycliffe managed to score two runs in their half of the second, but School came back with four runs in the last half of the third. They made short work of the Wycliffe batsmen in the fourth, and so ended School's fourth straight victory, 4-2.

This practically assures the team of the group and a place in the play-offs. May their present success follow them in their future games in the search for the interfaculty title.

The team: O. Bush, J. Grosskurth, J. Christo, H. Sissons, J. Anderson, J. Thompson, J. Procunier, W. Archer, J. Gorman, J. Ferguson, F. Philpot, Geo. Peacock (Manager).

JUNIOR BASEBALL

BACK ROW: G. McGill, J. Reynolds, A. Barry, J. Fisher, G. Kennedy, F. Howard, W. Diak, J. Anderson (Manager).
FRONT ROW: F. Brown, J. Milne, M. Scott, H. Coons, D. McArthur.

# Senior School Rugby

Back in '31, they say, School rugby teams did all their practising during their games. Times must have changed a little as, even at Survey Camp this year, the boys had high hopes and were getting into condition. When practices were called under the leadership of Coach Bill Usatis, some of our members had a place already dusted off for the Mulock Trophy. It was not until after our disappointing final game with the Fighting Irish that the dust was allowed to collect again for another year.

Our team, captained by George Peacock and Nels Hogg, played good rugby. These two stellar players, assisted by Bill McPherson and J. O. (Orlando) Gorman, as halves and Bobby Galway as quarter, handled the back field. Peacock's toe accounted for most of our points. On the defensive, Hogg's secondary work was a pleasure to watch while, on many an occasion, the feet of Galway ran us out of a tight corner.

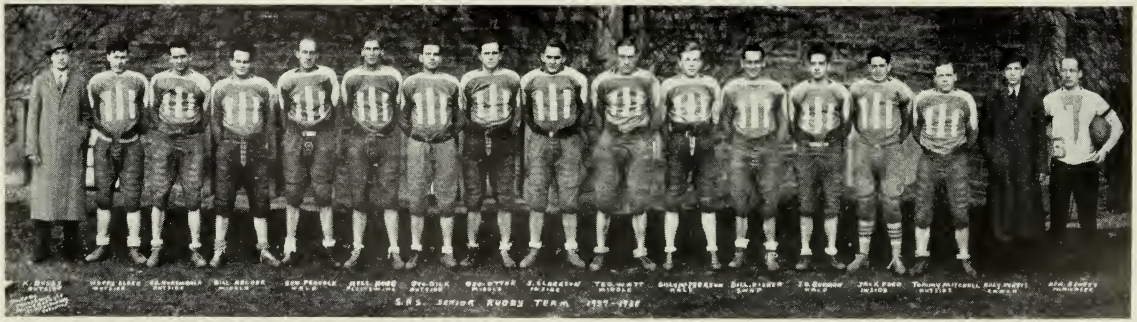
At regular intervals through the season we had the misfortune of losing a player through injuries. The first was Keith Busby, with a dislocated elbow. About the time "mid season" rolled along, George Dewart injured a leg. Then nearer the end, Bill Burgess went out with a bad hip and Galway with a broken ankle.

In the first game with our traditional rivals, Meds, we emerged on the long end of a 4 - 1 score. However, in the next, St. Mike's had the audacity to kick two points to our none. Meds were again taken to the tune of 7 - 0 and St. Mike's were properly put in their place with a defeat of 6 - 0 .

In the sudden death game with the Irish for the group championship there was no winner. The score was 0 - 0 and the game was just that close. A second game was fully as closely fought but the breaks decided the issue in favour of St. Mike's and left them on the "long" end of a 1 - 0 score. This at last ended a season in which the boys scored 17 points with only 4 against them in six games. On the Interfaculty All Star team, we had five representatives in Peacock, Hogg, Watt, Ford, and Disher.

S.P.S. JUNIOR RUGBY TEAM

W. Moore, W. McLean, Y. Williamson, K. Clawson, J. Munro, G. Kennedy, P. Morgan, J. Sterling, W. Patterson, R. Forester, A. Barrie, H. Amey, E. Reynolds, V. DePaul, M. Kilpatrick, A. Black, J. Barnes, A. Raney, R. Fugler, G. Murry, G. Warner, J. Brisley, I. Sloane.



SENIOR RUGBY

LEFT TO RIGHT: K. Busby, R. Alden, E. Horembala, W. Archer, G. Peacock, N. Hogg, G. Dick, G. Otter, J. Clarkson, E. Watt, W. McPherson, W. Disher, J. Ford, T. Mitchell, W. Usatis (Coach), H. Bengry (Mgr.).

## Junior School Rugby

The Junior School Rugby Team was composed of players of real ability from the very start of the season, as is seen from the fact that they placed four men on the Interfaculty All Star Team. Despite several injuries, the team played inspired football all season, and worked hard for a berth in the finals.

Our traditional rivals, Meds, proved to be easy opposition, dropping two games to School. Victoria edged out a 4 - 3 victory over our team in the first game, and last year's Mulock Cup Champions realized that School was the team to beat. U. C. was School's next victim, and then the team's crowning achievement of the season came when they downed the powerful Victoria Interfaculty Champs 12 - 1. U. C. provided the final opposition of the year, and we needed a win for a tie with Victoria. However, a combination of overconfidence and bad breaks gave the game to U. C., and the group championship to Victoria.

Although the result was disheartening, the team had a good time and gained experience. Next year brings a new season and we feel sure that S.P.S. will be represented in the finals.

## Junior School Basketball

Although the Junior team looked good in the pre-season workouts, they were hopelessly out-lucked all through the schedule.

In the first encounter they led Junior U. C. at half time, only to have the Arts men come back in the second stanza and win 23-16. The next game with Victoria Juniors was a battle all the way, with Vic scoring the final basket with but fifteen seconds to go to make the score 17-15. They led the classy Meds team all the way in the third game, with Meds winning on a long shot with less than a minute to play to take the game 16-15.

Both U. C. and Vic won their next two games with little trouble, and at the time of going to press the second game with Meds has not been played, but appears to be a foregone conclusion. In spite of their poor showing, the team has a wealth of material and, being made up almost entirely of Freshmen, it should be able to help School out in the next couple of years.


JUNIOR BASKETBALL

BACK ROW: J. Reynolds, R. Pile, F. Allen, W. Wallace, A. Halford.
FRONT ROW: C. Edmonds, W. Dawson, H. Coons, M. Kilpatrick, B. Chalett.

# School Intermediate Basketball

The Intermediate basketball team is composed of men who have not been picked by the Senior and Junior School teams, and was organized to give the less skilled players an opportunity to gain experience and, in general, have the fun of playing on a School team. This year, however, it appears that the Junior and Senior managers passed up some good bets, as the third team has been able to form a unit that can "take" either of the other teams at least half the time.

The team is fortunate in having a taller-than-average group of players that are scrappy, fast moving and clean ball handlers. Possibly their greatest asset lies in their team play. There is no single star on the line-up as, in every game so far, practically every player has taken some part in the scoring and no one player has out-scored the others by more than a couple of points.

The team was put in a comparatively easy grouping, being bracketed with Meds III, Pharmacy II, St. Mikes II and Trinity. Up to the time of writing, the team has won five games and lost one, that being a close game to Meds. Meds have also lost a game and the other teams are definitely out, so the "crooshul" game will be the return match with the boys across the road. With their most recent victory being a 36-4 sweep, the "gang" feel confident that they can finish on top. Their scoring power is indicated by an average score of 25 points per game, with 11 points per game against.

If, in their remaining two games of the schedule, the team is fortunate enough to survive and enter the play-offs (and the game times do not clash with examination hours), the boys have hopes of showing the University that they are the third team in name only. If the fates are against them, they can rest easily with the knowledge that they were School's biggest point winners in the Sifton Cup race.

The team: Jack Detweiler (manager and coach), Jack Fisher, Bill Rapsey, Charlie Bishop, Jack Ferguson, Harvey Reid, Murve Taylor, Allan Pilsworth, Norm Thompson and Keith Busby.

S.P.S. SENIOR BASKETBALL TEAM

SECOND ROW: R. Shaw, G. Peacock, N. Harlock, J. Gibson, R. Mark
FIRST ROW: F. Johnson, S. Murray, C. Archibald, J. Gorman, B. Ballagh.


SENIOR HOCKEY

BACK ROW: D. Willmot (Coach), J. Ford (Mgr.), B. Moriarty, J. Smart, R. Cavanagh, R. Galway, M. O'Leary, G. Giddings.
FRONT ROW: N. Smith, W. Disher, I. Thompson, W. Pringle, J. Leslie.

## Senior School Basketball

Away back in January, School lined up the '38 edition of its Senior basketball squad, and a fine looking outfit it was too—on paper. But alas, when the chips were down, the boys just did not seem to have that extra umph that so often spells victory.

Unfortunately, we were grouped with such formidable teams as Senior Meds, Senior Vic, and Senior U. C., and as a result ended the season winless. However, we did come close (pardon us for bragging) to winning twice, dropping a couple of one point decisions to Senior U. C. 33-32 and 29-28.

Then, there are those staunch supporters of the team, who claim that no team, no matter how good, can win a game carrying around such gaudy-looking uniforms as the Athletic Association wrapped us in this year. Yellow satin (Yeah! Branksome!). Nevertheless, in no game was the team very seriously outclassed, and even the champion Meds knew that they had been in a ball game when they finally dragged themselves to the showers.

One thing is certain, though, we feel safe in saying we had more fun losing six games than the rest of the group had beating us. The fellows were really a swell bunch and maybe next year, with the remnants, we'll surprise everyone by taking the silverware.

## Senior School Hockey

At the time of writing, the Jennings' Cup is still a bone of contention, with Senior School having an outside chance to gain a place in the play-offs.

Senior S.P.S. started off well by winning from Trinity by a 1 - 0 score. Then came three losses from Junior School, Junior Meds and Dents by scores of 1 - 0, 6 - 5, and 5 - 0, respectively. However, the boys came back strong against Pharmacy with a 3 - 0 win.

Our defence of O'Leary, Pringle and Smart went great guns both ways and certainly deserved special mention. Our forward lines of Disher, Galway and Smith, and Cavanagh, Leslie and Moriarty also tried hard all the way.

However, if we fail to win the "Cup" this year, we hope to be back stronger than ever next year.

JUNIOR HOCKEY

BACK ROW: G. Wood (Coach), W. Robinson, E. Bridgland, J. Scrivener, K. McQuarrie, J. Munro, E. Galway, W. Moore.
FRONT ROW: J. Greer, D. McArthur, D. Turner, E. Weir, H. Mole.
ABSENT: D. Crichton

# Junior School Hockey

The 1937-38 edition of Junior School Hockeyists was a well-balanced aggregation, very ably coached by George Wood.

Pre-season predictions of a championship club were not very promising as there were left only three of the previous year's team as a nucleus for the new squad. However, it took only one work-out to show that Junior School would have a team capable of causing plenty of opposition for the rest of them in the Inter-Faculty League.

The net-minding job was equally shared and equally well attended to by Bill Moore, a freshman, and by Doug. Turner, the Varsity footballer. At defence, Ed. Bridgland, Rod Scrivener, and Steve Munro body-checked beside the smooth-working Dave Crichton. On the forward lines, Bill Robinson centered Galway and Munro, while Hugh Mole worked between Weir and Greer. Sandy MacArthur, Dave Watters and Ken McQuarrie (manager), rounded out the squad.

During the season George Wood and Dave Crichton were lost to the team as active players, both going with Varsity Intermediates. This weakened the team considerably.

The first game of the season, after very little practice, was lost to Junior Meds, but the team came back strongly with a win over Senior School and a tie with the powerful Vic squad. The following two games consisted of a loss to Dents and a win over Pharmacy. At time of writing there is still a chance of making the play-off, but the chief opposition to this endeavour is the difficulty of securing practices. Nevertheless, the team will be trying hard.

JUNIOR WATER POLO

BACK ROW: F. Lysaght, T. Kingsbury, R. Byrnes.
FRONT ROW: F. Walsh, W. Laari, B. Starchuk, E. Bainbridge


SENIOR WATER POLO

BACK ROW: H. deV. Partridge, G. Otter (Coach), B. Tedman.
FRONT ROW: R. Orok, G. Giddings, L. Chambers, J. Millar.
ABSENT: W. Usatis.

## Senior School Waterpolo

Senior School had a tough time with the water polo schedule this year and, after a wet time, splashed through the regular games with a clean record of no wins. Thus the title "Champs"(?).

However, the word "Champs" has a double meaning. With only seven men on the team, each man had to do the iron man stunt of playing a full game without a substitute. No other team in the league can make this boast, and the honour of the Little Red School House was upheld by fight, if not by numbers.

As the season went on, and the team's condition became somewhat better, the squad put up a great fight against U. C., the group leaders, and although they outplayed their opponents, the final score ended 1 - 0 for U. C.

When an unfortunate Lab accident prevented Garn Giddings from playing the last game, Bill Veal took his place and turned in an excellent game at centre. Jack Millar and Giddings are the only graduating members, leaving Captain Lloyd Chambers, Bob Orok, Blake Tedman, Bill Usatis, and Partridge to form a solid foundation on which to build a championship team for next year, and bring the Eckhart Trophy to its proper resting place.

## Junior School Waterpolo

The practices were started immediately after the Christmas vacation and there was quite a good turnout in response to the notices posted for the first practice. Unfortunately, the schedule started after only three workouts, and also the team was entered in the group which had two of the league's strongest teams, namely, Vic, who went through to win the championship, and Trinity. However, they fared quite well against such strong competitors, and although thy did not win any games, tying one, they always went down fighting.

There will be some good material for a championship team next year, although some of the members graduate to Senior company. So don't be too surprised if Jr. School end out on top next year and bring back the Eckhardt trophy to the Old Red Schoolhouse.

# The Rifle Association

The Engineers have had another successful year in the Rifle Association. According to custom, they carried off the handsome Mitchell Cup, presented by our Dean for interfaculty competition. They were also largely instrumental in winning for Varsity the small-bore championship of Toronto.

The Mitchell Cup was won with a score of 970 points out of 1,000, the highest in several years. Arts were a distant second with 944 points, and Meds third with 940. The men comprising the winning team and their scores were: J. E. Lee. 197; W. E. W. Steeves, 195; J. I. Thompson, 194; C. Miall, 194; D. C. Anderson, 190.

In the Toronto Indoor Rifle League, the team representing the University remains undefeated in the series of matchs conducted throughout the winter. This brings to Varsity, for the second time in history, the keenly contested Robins Trophy. The following Schoolmen were on the seven-man team; A. S. Foreman (Grad), J. I. Thompson, C. Miall, W. E. W. Steeves, and J. E. Lee. The highest individual aggregate score in the league was made by A. S. Foreman with 1,972 points out of 2,000.

Other Schoolmen should be mentioned also for their good showing in individual competition; M. D. Bleaken, M. K. Strang, J. M. King, J. D. Near and D. W. Staples.

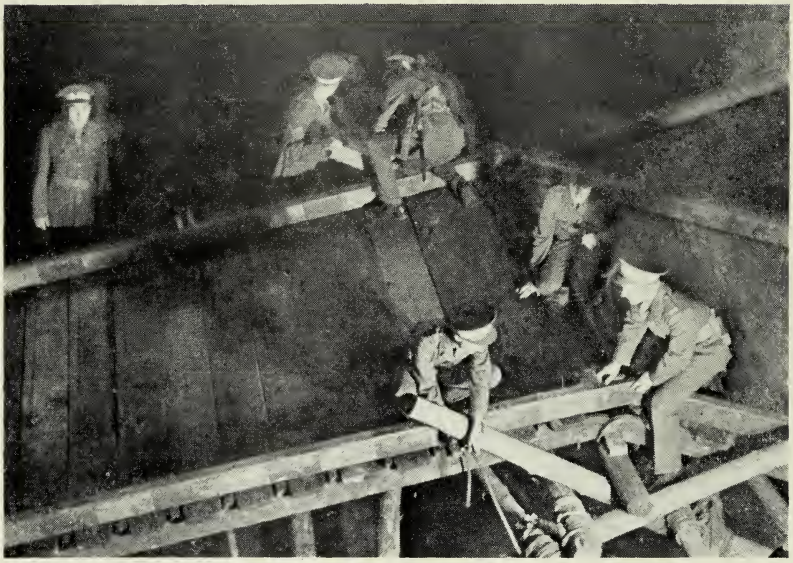
A brief description of the activities of the Rifle Association should be of interest to Schoolmen, for they comprise over 50% of the membership. Beginning with the opening of the first term, long range outdoor shooting with the 303 rifle is carried on every Saturday afternoon at the Long Branch rifle ranges. This is a very popular sport, especially since the ammunition is provided free. About the end of October the outdoor season closes with the Interfaculty Match.

Driven from the outdoor range by the wintry blasts, the members seek refuge in the finest indoor range in Toronto, situated near the locker room in Hart House. Here the members may shoot with fine .22 calibre B.S.A. match rifles, ammunition being provided free.

Competitions are frequent and the membership is divided into four classes, according to ability, thus giving everyone a chance of winning something and an incentive to shoot well. The shooting for this year is over; let's all join early next year. If you can shoot, we need you; if you can't we will teach you.

Jas. E. Lee,
*Team Captain.*

# "C" Company C.O.T.C., 1937-38



As Honourary Colonel of the University of Toronto Contingent of the Canadian Officers Training Corps, I very gladly commend to undergraduates the activities of this organization, related both to the Dominion Government and to the University. Those who join the Corps and complete the annual course receive credit for the Physical Training, which is compulsory in the first and second years.

In addition to the physical fitness which is thereby gained, the members receive a basic training in Military Science, so that they may obtain certificates of qualification as officers in the Canadian Militia and in other Empire Forces.

The training in this Corps does not foster what is called "militarism", but, it does foster a sane love of one's country and a willingness to serve and defend it. A strong and united British Empire is one of the greatest instruments in stabilizing and maintaining the peace of the world.

In the Corps leadership is developed; the value of discipline is recognized; an *esprit de corps* is created; men learn self respect and respect for others, punctuality, the power to think quickly and act correctly. He who learns to obey learns also to lead and to command.

The essence of the training is cleanliness of body and of mind. A distinguished religious leader of this continent urges discipline, self-discipline, as one of the chief requirements of the age. The training in the C.O.T.C. makes a real contribution toward the production of citizens who are self controlled and who place public good above personal interest.

H. J. CODY,
*Honorary Colonel, U. of T., C.O.T.C.*

During the current training season, ninety-one undergraduates in the Faculty of Applied Science and Engineering were enrolled in "C" Company. Of these, twenty-six were preparing for certificates "A" and "B", which qualify for commissions of Lieutenant and Captain respectively, in the Defense Forces of the Empire. Qualification may be obtained in various branches of the service, including Artillery, Artillery Survey, Engineers, Signals and Infantry.

Many graduates have adopted a military career, obtaining commissions in the British and Canadian Defense Forces and the Indian Army. Attractive offers are now being made to qualified University men.

In the annual Rifle Course at Hart House Range, "C" Company stood second, scoring 69.4 as compared with "D" Company, the winners, who scored 69.8. The best shots in "C" Company are Cadet L. N. Stanners with 109 and Cadet W. E. Steeves with 108 out of a possible 115. These men stood third and fourth in the contingent and

will receive prizes of $8.00 and $5.00 respectively. The Officers of the Contingent also received revolver training this year.

The Annual C.O.T.C. Ball, held in Hart House on February 11, maintained the high standards of other years. Some thought it the best yet. The committee in charge enjoyed the leadership of Captain Carswell, whose exceptional talents and enthusiasm have contributed largely to its success over a period of years.

"C" Company was honoured by the choice of Company Sgt. Major G. H. Elms, Third Year Mechanical, to represent the C.O.T.C. in the Canadian Contingent attending the Coronation of Their Majesties, King George VI. and Queen Elizabeth.

The Contingent is commanded by Lt.-Col. H. H. Madill, V.D., m.s.c., Head of the School of Architecture. Officers of "C" Company are:

Major M. B. Watson, m.s.c.
Director, Dept. of Military Studies.
Lieut. G. T. Hodgson,
IV. Year Electrical.
Lieut. C. Bridges,
IV. Year Chemical.
Lieut. G. T. Maher,
III. Year Mechanical.
2/Lt. H. E. de Lagran,
IV. Year Electrical.

*Graduation*